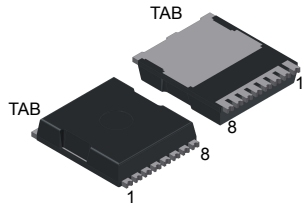
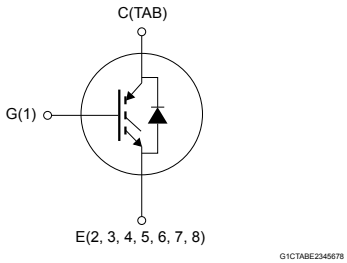
STGO30H60DLLFBAG

Datasheet

Automotive-grade trench gate field-stop, 600 V, 30 A, high-speed HB series IGBT in a TO-LL package



TO-LL type B



Features

- AEC-Q101 qualified
- Maximum junction temperature: T_J = 175 °C
- Logic level gate drive
- High-speed switching series
- Minimized tail current
- $V_{CE(sat)}$ = 1.6 V (typ.) @ I_C = 30 A
- Low V_F soft-recovery co-packaged diode
- Tight parameter distribution
- Safer paralleling
- Low thermal resistance

Applications

- Automotive injection

Description

This device is an IGBT developed using an advanced proprietary trench gate field-stop structure. The device is part of the new HB series of IGBTs, which represents an optimum compromise between conduction and switching loss to maximize the efficiency of any frequency converter. Furthermore, the slightly positive $V_{CE(sat)}$ temperature coefficient and very tight parameter distribution result in safer paralleling operation.

Product status link
STGO30H60DLLFBAG

Product summary	
Order code	STGO30H60DLLFBAG
Marking	GO30H60DLL
Package	TO-LL type B
Packing	Tape and reel

1 Electrical ratings

Table 1. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{CES}	Collector-emitter voltage (V_{GE} = 0)	600	V
I_C	Continuous collector current at T_C = 25 °C	60	A
	Continuous collector current at T_C = 100 °C	30	A
I_{CP}(1)	Pulsed collector current	120	A
V_{GE}	Gate-emitter voltage	±10	V
I_F	Continuous forward current at T_C = 25 °C	60	A
	Continuous forward current at T_C = 100 °C	30	
I_{FP}(1)	Pulsed forward current	120	A
P_{TOT}	Total power dissipation at T_C = 25 °C	263	W
T_{STG}	Storage temperature range	-55 to 150	°C
T_J	Operating junction temperature range	-55 to 175	°C

1. t_p<1 µs.

Table 2. Thermal data

Symbol	Parameter	Value	Unit
R_{thJC}	Thermal resistance, junction-to-case IGBT	0.57	°C/W
	Thermal resistance, junction-to-case diode	1.51	
R_{thJA}	Thermal resistance, junction-to-ambient	73	°C/W

2 Electrical characteristics

T_C = 25 °C unless otherwise specified

Table 3. Static characteristics

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)CES}$	Collector-emitter breakdown voltage	V_{GE} = 0 V, I_C = 1 mA	600			V
$V_{CE(sat)}$	Collector-emitter saturation voltage	V_{GE} = 5 V, I_C = 30 A		1.6	2.0	V
		V_{GE} = 5 V, I_C = 30 A, T_J = 125 °C		1.7		
		V_{GE} = 5 V, I_C = 30 A, T_J = 175 °C		1.75		
V_F	Forward on-voltage	I_F = 30 A		1.4	1.7	V
		I_F = 30 A, T_J = 125 °C		1.35		
		I_F = 30 A, T_J = 175 °C		1.25		
$V_{GE(th)}$	Gate threshold voltage	V_{CE} = V_{GE}, I_C = 1 mA		1.8	2.5	V
I_{CES}	Collector cut-off current	V_{GE} = 0 V, V_{CE} = 600 V			25	µA
I_{GES}	Gate-emitter leakage current	V_{CE} = 0 V, V_{GE} = ± 10 V			±250	µA

Table 4. Dynamic characteristics

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{ies}	Input capacitance	V_{CE}= 25 V, f = 1 MHz, V_{GE} = 0 V	-	5000	-	pF
C_{oes}	Output capacitance		-	120	-	
C_{res}	Reverse transfer capacitance		-	75	-	
Q_g	Total gate charge	V_{CC} = 520 V, I_C = 30 A, V_{GE} = 5 V	-	110	-	nC
Q_{ge}	Gate-emitter charge		-	16	-	
Q_{gc}	Gate-collector charge		-	42	-	

Table 5. IGBT switching characteristics (inductive load)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(off)}$	Turn-off delay time	V_{CE} = 400 V, I_C = 30 A, V_{GE} = 5 V, R_G = 10 Ω	-	402	-	ns
t_f	Current fall time		-	15	-	ns
E_{off} (1)	Turn-off switching energy		-	540	-	µJ
$t_{d(off)}$	Turn-off delay time	V_{CE} = 400 V, I_C = 30 A, V_{GE} = 5 V, R_G = 10 Ω, T_J = 175 °C	-	434	-	ns
t_f	Current fall time		-	24	-	ns
E_{off} (1)	Turn-off switching energy		-	660	-	µJ

1. *Including the tail of the collector current.*

2.1 Electrical characteristics (curves)

Figure 1. Total power dissipation vs temperature

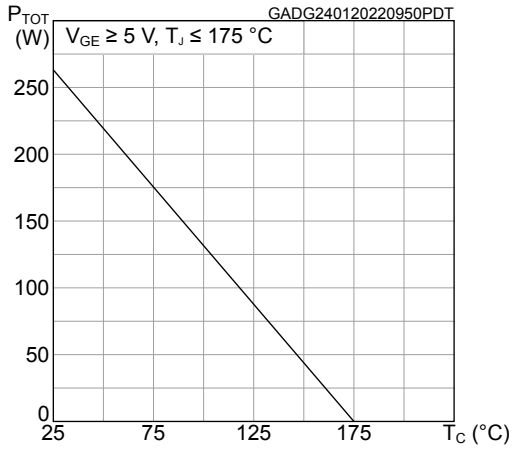


Figure 2. Maximum collector current vs temperature

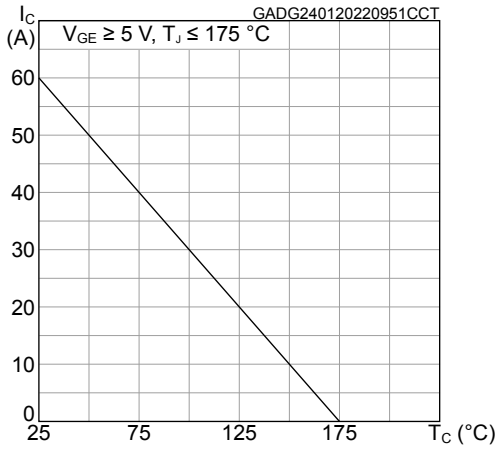


Figure 3. Typical output characteristics (T_J = 25 °C)

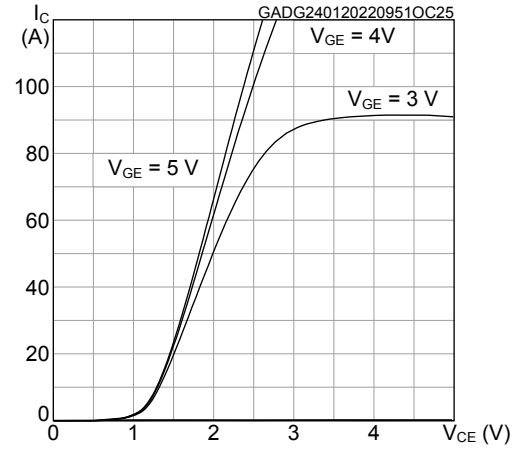


Figure 4. Typical output characteristics (T_J = 175 °C)

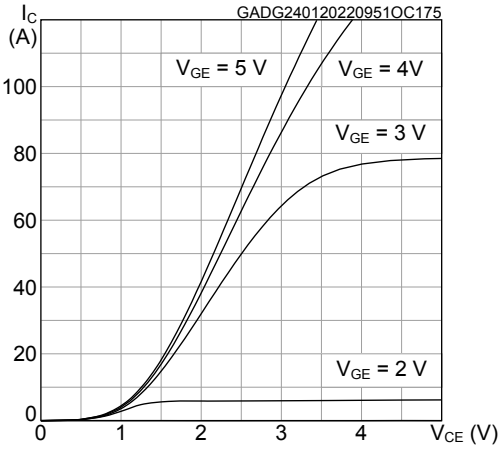


Figure 5. Typical $V_{CE(sat)}$ vs temperature

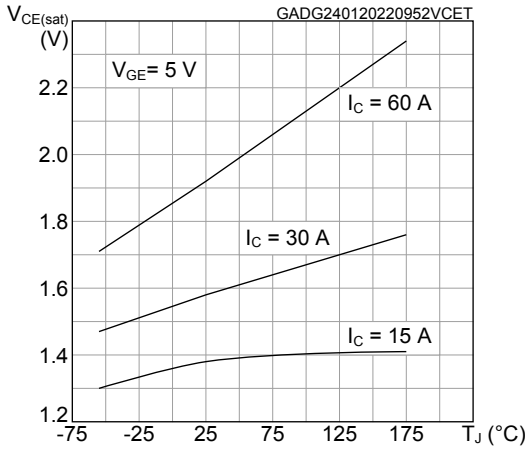


Figure 6. Typical $V_{CE(sat)}$ vs collector current

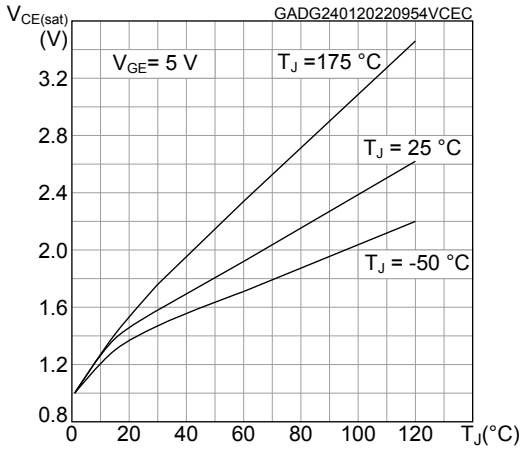


Figure 7. Collector current vs switching frequency

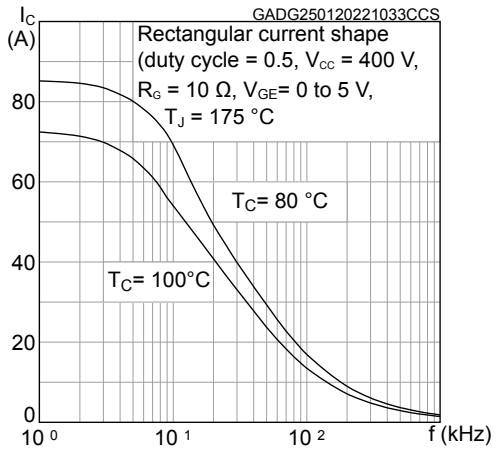


Figure 8. Forward bias safe operating area

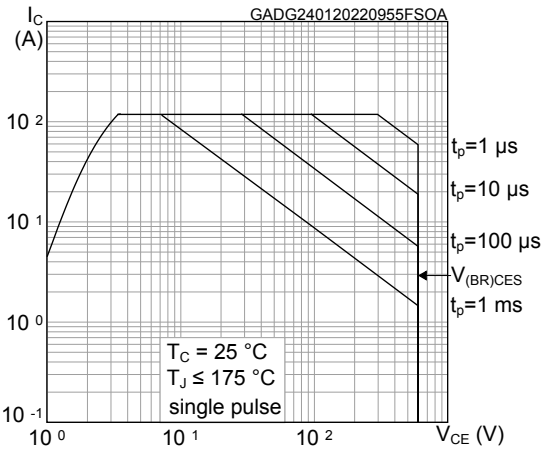


Figure 9. Typical transfer characteristics

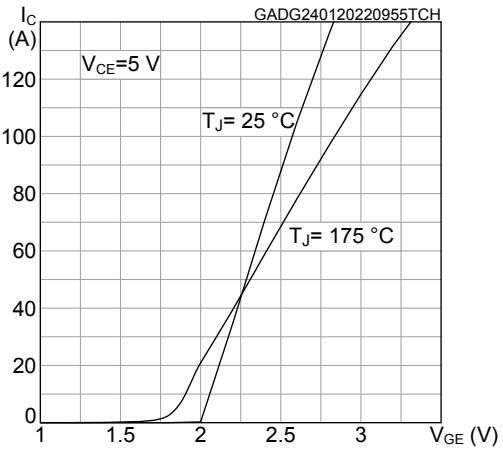


Figure 10. Typical reverse diode forward characteristics

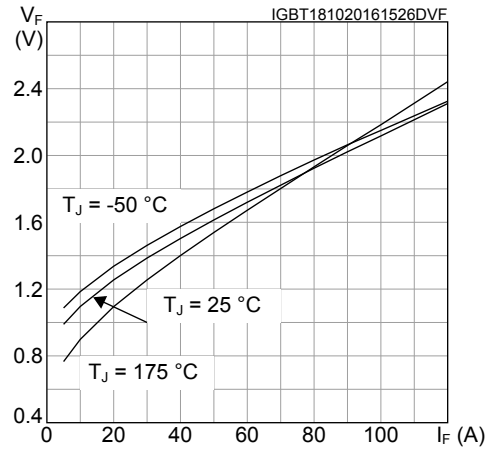


Figure 11. Normalized gate threshold vs temperature

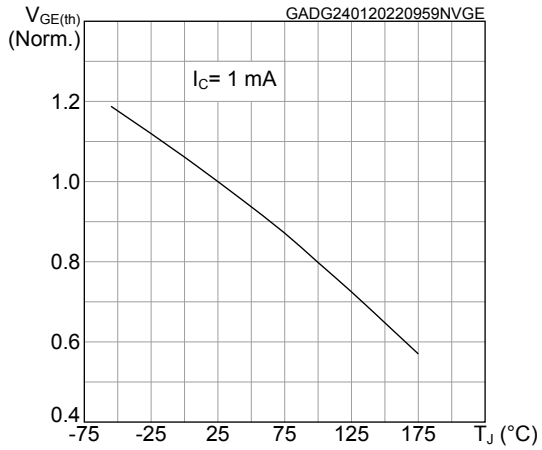


Figure 12. Normalized breakdown voltage vs temperature

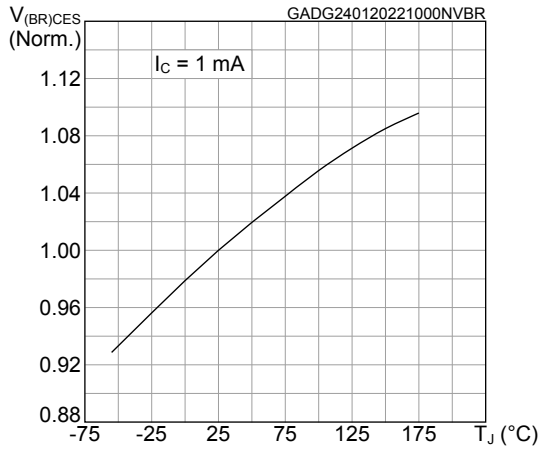


Figure 13. Typical capacitance characteristics

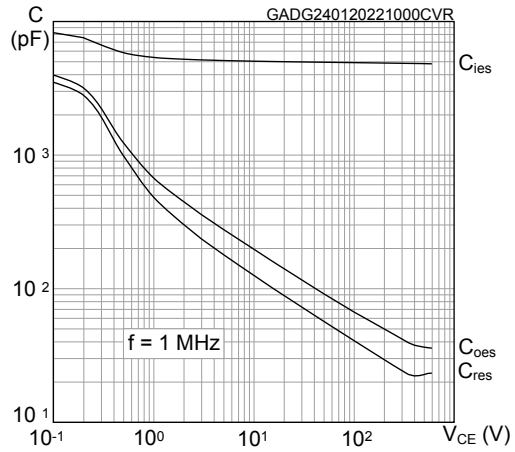


Figure 14. Typical gate charge characteristics

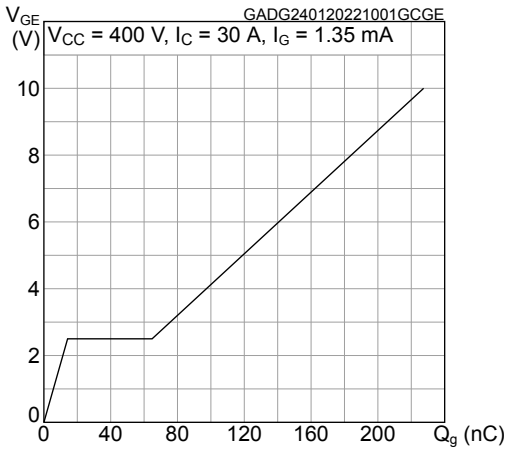


Figure 15. Typical switching energy vs collector current

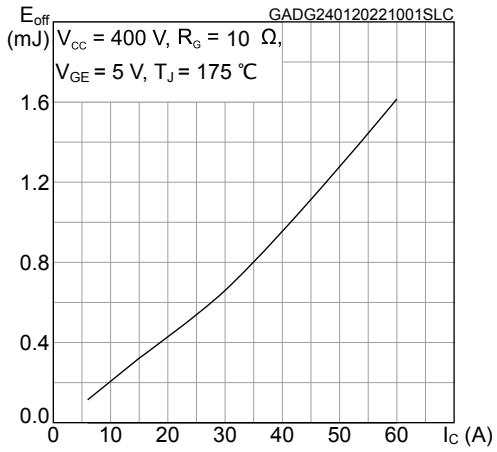


Figure 16. Typical switching energy vs gate resistance

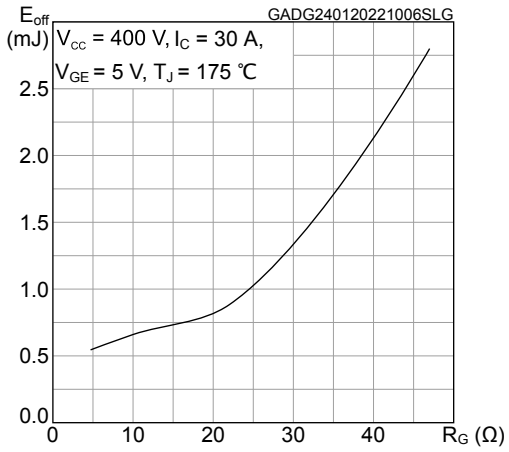


Figure 17. Typical switching energy vs temperature

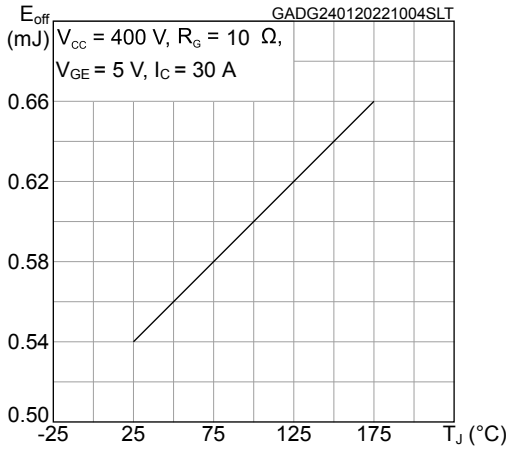


Figure 18. Typical switching energy vs V_{CE}

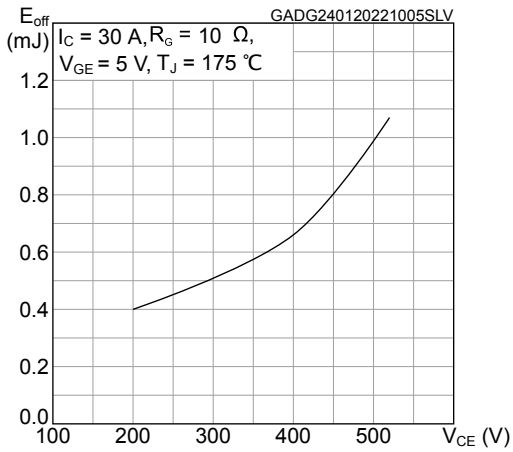


Figure 19. Typical switching times vs collector current

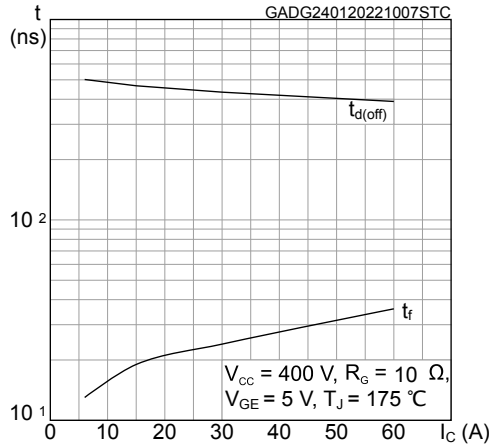


Figure 20. Typical switching times vs gate resistance

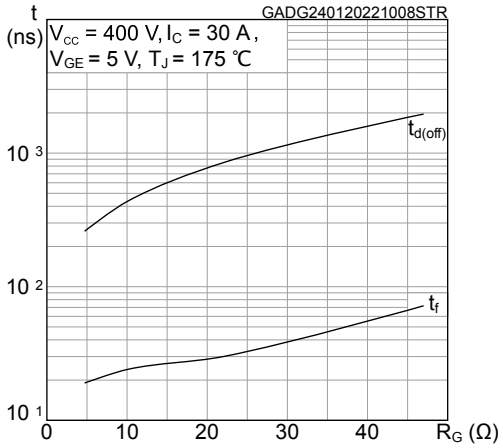


Figure 21. Maximum transient thermal impedance for IGBT

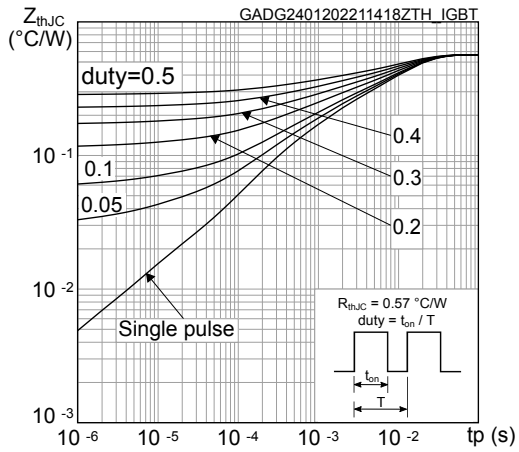
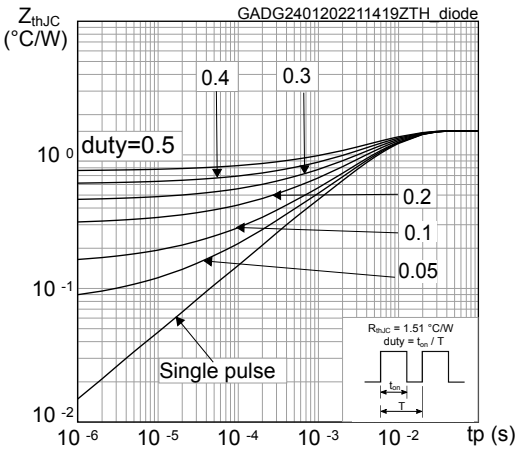


Figure 22. Maximum transient thermal impedance for diode



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. ECOPACK is an ST trademark.

3.1 TO-LL type B package information

Figure 23. TO-LL type B package outline

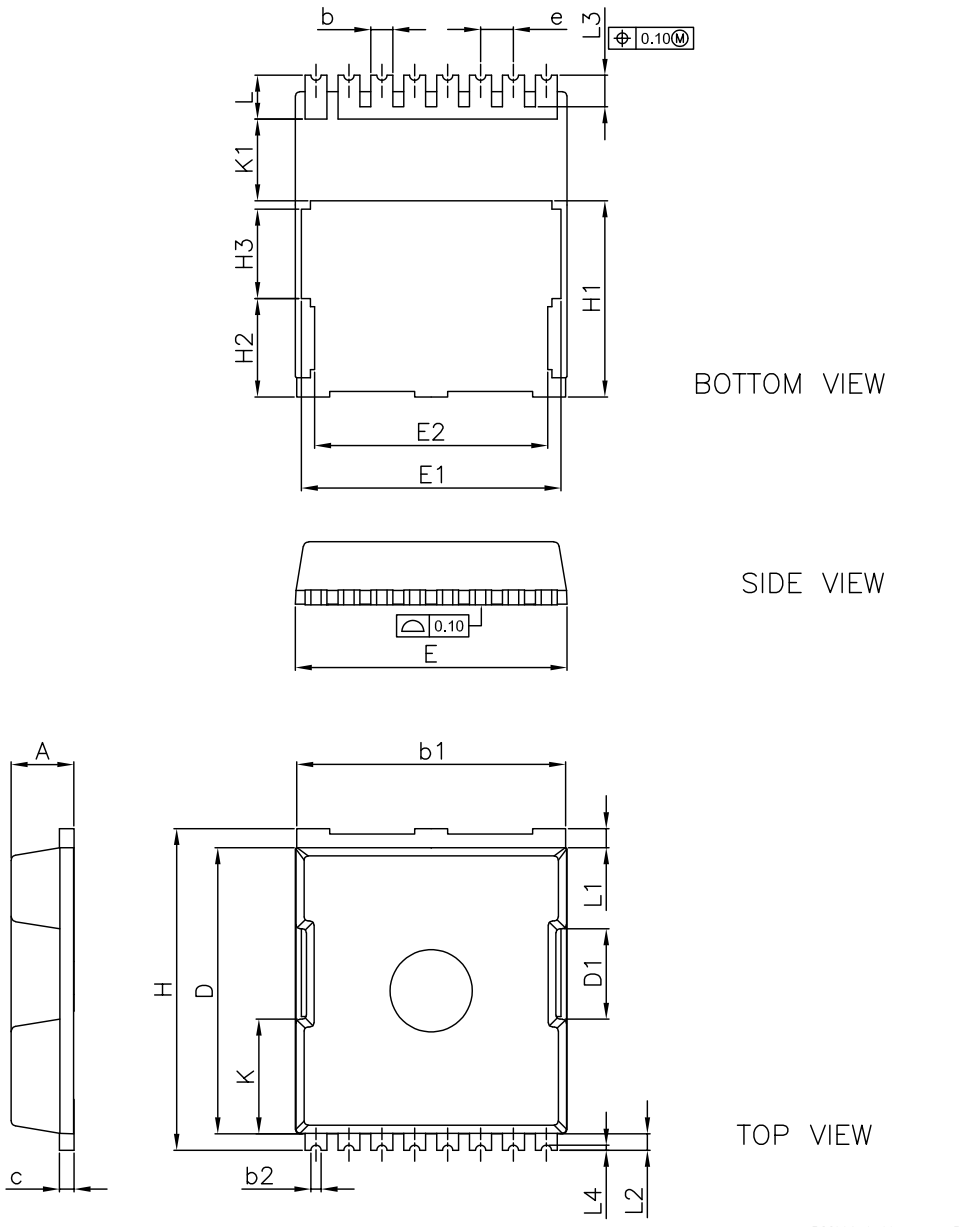
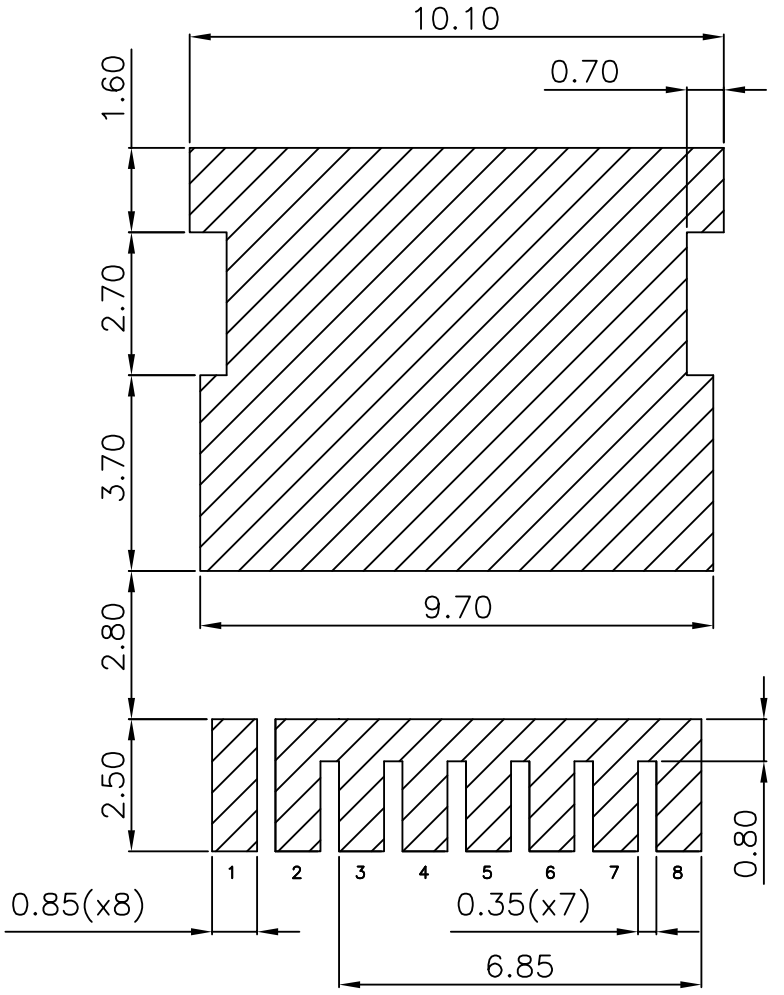


Table 6. **TO-LL type B package mechanical data**

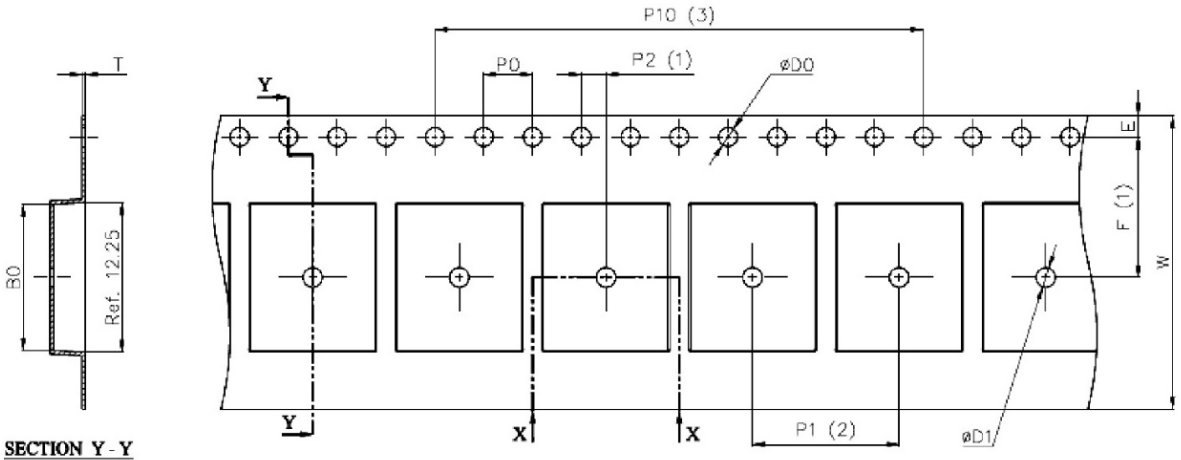
Dim.	mm		
	Min.	Typ.	Max.
A	2.20	2.30	2.40
b	0.60	0.80	0.90
b1	9.70	9.80	9.90
b2	0.20		0.50
c	0.40	0.50	0.60
D	10.28	10.43	10.58
D1	3.15	3.30	3.45
E	9.70	9.90	10.10
E1	9.31	9.46	9.61
E2	8.35	8.50	8.65
e	1.10	1.20	1.30
H	11.48	11.73	11.88
H1	7.00	7.15	7.30
H2	3.34	3.59	3.84
H3	3.11	3.26	3.41
K	4.03	4.18	4.33
K1	2.70		
L	1.45	1.60	1.75
L1	0.55	0.70	0.85
L2	0.45	0.60	0.75
L3	1.00	1.15	1.30
L4	0.05		0.40

Figure 24. **TO-LL type B recommended footprint (dimensions are in mm)**



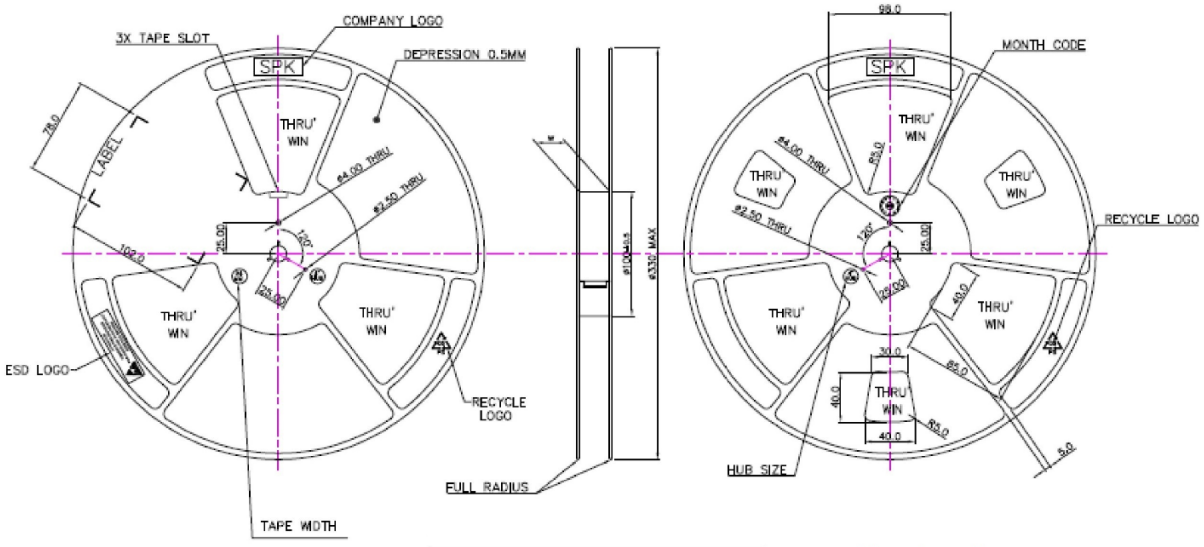
3.2 TO-LL packing information

Figure 25. **Carrier tape outline and dimensions**



Dimension List			
Annote	Millimeter	Annote	Millimeter
A0	10.20±0.10	P2	2.00±0.10
B0	11.98±0.10	P10	40.00±0.20
K0	2.60±0.10	E	1.75±0.10
D0	$1.50^{+0.10}_{-0}$	F	11.50±0.10
D1	1.60±0.10	W	24.00±0.30
P0	4.00±0.10	T	0.30±0.05
P1	12.00±0.10		

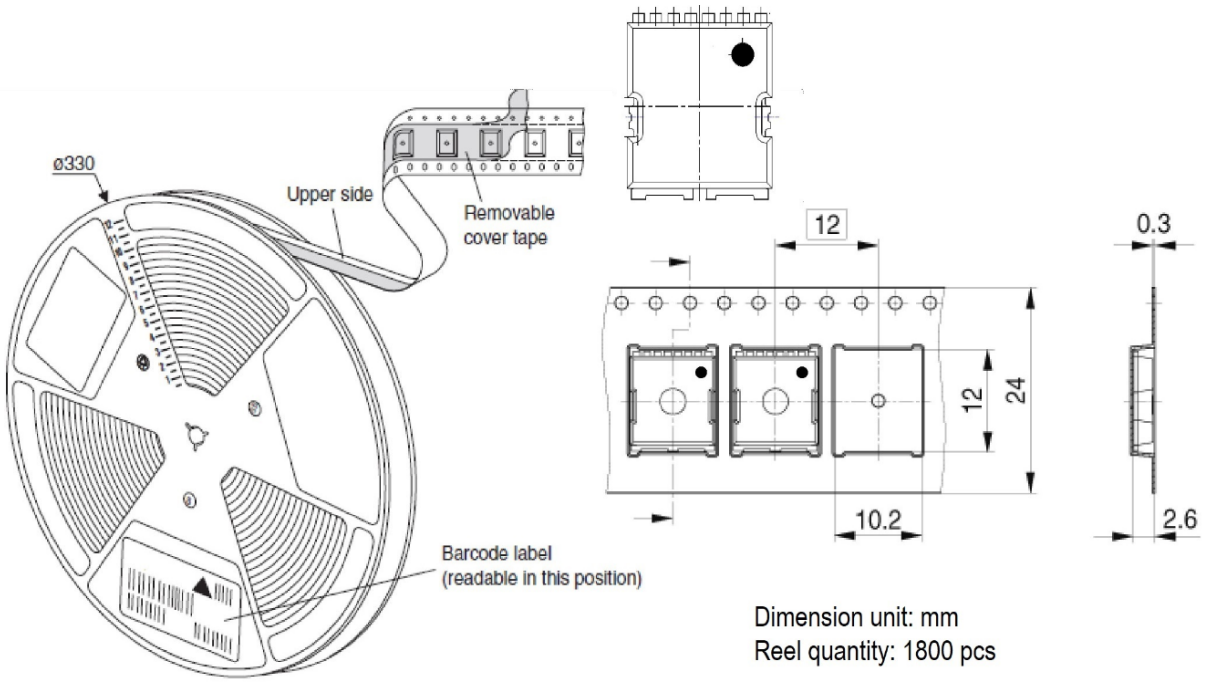
Figure 26. **Reel outline and dimensions**



SPECIFICATION							
TAPE WIDTH	W	U	X	V	Y	Z	P
24mm	24.4	1.50	24.5	20.0	0.55	6.00	2

Dimension unit: mm

Figure 27. **TO-LL orientation in tape pocket**



Revision history

Table 7. **Document revision history**

Date	Revision	Changes
08-Feb-2019	1	First release.
11-Nov-2020	2	Updated *Section 3.1 TO-LL type B package information.* Added *Section 3.2 TO-LL packing information.* Minor text changes.
18-Oct-2021	3	Modified marking on cover page. Modified *Table 1. Absolute maximum ratings.* Updated *Section 3.1 TO-LL type B package information.* Minor text changes.
25-Jan-2022	4	Modified Features. Modified Section 1 Electrical ratings, Table 3. Static characteristics and Table 5. IGBT switching characteristics (inductive load). Added Section 2.1 Electrical characteristics (curves). Minor text changes.

Contents