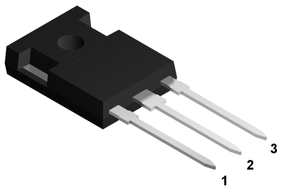
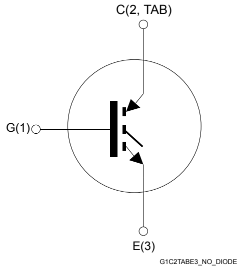
STGWA80H65FBAG

Datasheet

Automotive-grade trench gate field-stop 650 V, 80 A high speed HB series IGBT in a TO-247 long leads



TO-247 long leads



Features

- AEC-Q101 qualified
- Maximum junction temperature: T_J = 175 °C
- High-speed switching series
- Minimized tail current
- $V_{CE(sat)}$ = 1.65 V (typ.) @ I_C = 80 A
- Tight parameters distribution
- Safer paralleling
- Low thermal resistance

Applications

- PFC
- High frequency converters

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
STGWA80H65FBAG

Product summary	
Order code	STGWA80H65FBAG
Marking	G80H65FBAG
Package	TO-247 long leads
Packing	Tube

1 Electrical ratings

Table 1. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{CES}	Collector-emitter voltage (V_{GE} = 0 V)	650	V
I_C	Continuous collector current at T_C = 25 °C	120 (1)	A
	Continuous collector current at T_C = 100 °C	80	
I_{CP} (2)	Pulsed collector current (t_p = 1 ms)	240	A
V_{GE}	Gate-emitter voltage	±20	V
	Transient gate-emitter voltage (t_p ≤ 10 μs)	±30	
P_{TOT}	Total power dissipation at T_C = 25 °C	535	W
T_{STG}	Storage temperature range	-55 to 150	°C
T_J	Operating junction temperature range	-55 to 175	°C

1. *Current limited by package.*
2. *Pulse width is limited by maximum junction temperature.*

Table 2. Thermal data

Symbol	Parameter	Value	Unit
R_{thJC}	Thermal resistance, junction-to-case	0.28	°C/W
R_{thJA}	Thermal resistance, junction-to-ambient	50	°C/W

2 Electrical characteristics

T_J = 25 °C unless otherwise specified.

Table 3. Static characteristics

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{CE(sat)}$	Collector-emitter saturation voltage	V_{GE} = 15 V, I_C = 80 A		1.65	2.0	V
		V_{GE} = 15 V, I_C = 80 A, T_J = 125 °C		1.8		
		V_{GE} = 15 V, I_C = 80 A, T_J = 175 °C		1.9		
$V_{GE(th)}$	Gate threshold voltage	V_{CE} = V_{GE}, I_C = 1 mA	4.5	5.5	6.5	V

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	-	10460	-	pF
C_{oes}	Output capacitance		-	390	-	pF
C_{res}	Reverse transfer capacitance		-	215	-	pF
Q_g	Total gate charge	V_{CC} = 520 V, I_C = 80 A, V_{GE} = 0 to 15 V	-	453	-	nC

Table 5. Switching characteristics (inductive load)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(off)}$	Turn-off delay time	V_{CC} = 400 V, I_C = 80 A, V_{GE} = 15 V, R_G = 10 Ω	-	360	-	ns
t_r	Current rise time		-	84	-	ns
$di/dt_{(on)}$	Turn-on current slope		-	720	-	A/µs
E_{on} (1)	Turn-on switching energy		-	3.26	-	mJ
$t_{d(off)}$	Turn-off delay time		-	360	-	ns
t_f	Current fall time		-	66	-	ns
E_{off} (2)	Turn-off switching energy		-	2.33	-	mJ
E_{ts}	Total switching energy		-	5.59	-	mJ
$t_{d(off)}$	Turn-off delay time	V_{CC} = 400 V, I_C = 80 A, V_{GE} = 15 V, R_G = 10 Ω, T_J = 175 °C	-	375	-	ns
t_r	Current rise time		-	90	-	ns
$di/dt_{(on)}$	Turn-on current slope		-	690	-	A/µs
E_{on} (1)	Turn-on switching energy		-	5.24	-	mJ
$t_{d(off)}$	Turn-off delay time		-	375	-	ns
t_f	Current fall time		-	65	-	ns
E_{off} (2)	Turn-off switching energy		-	2.56	-	mJ
E_{ts}	Total switching energy		-	7.8	-	mJ

1. *Including the reverse recovery of the external diode. The diode is the same of the co-packed STGWA80H65DFBAG.*
2. *Including the tail of the collector current*

2.1 Electrical characteristics (curves)

Figure 1. Total power dissipation vs temperature

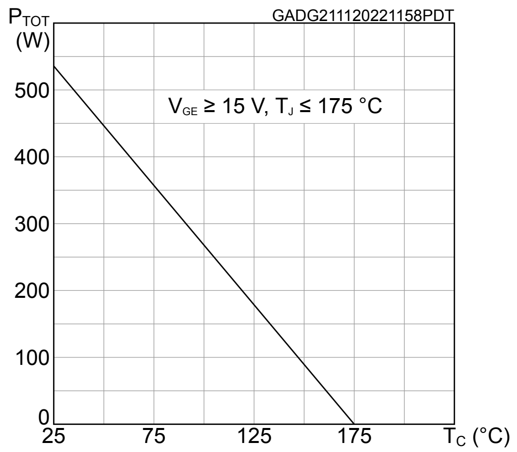


Figure 2. Collector current vs temperature

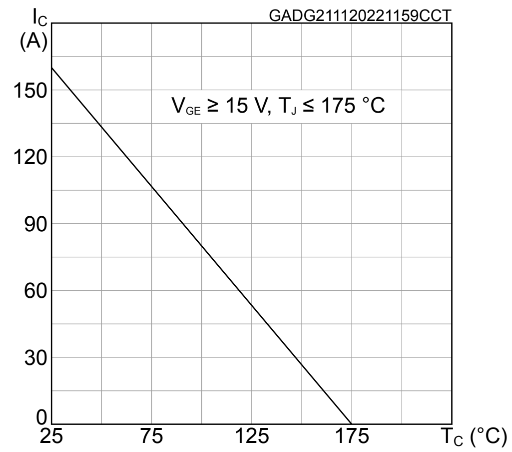


Figure 3. Typical output characteristics (T_J = 25 °C)

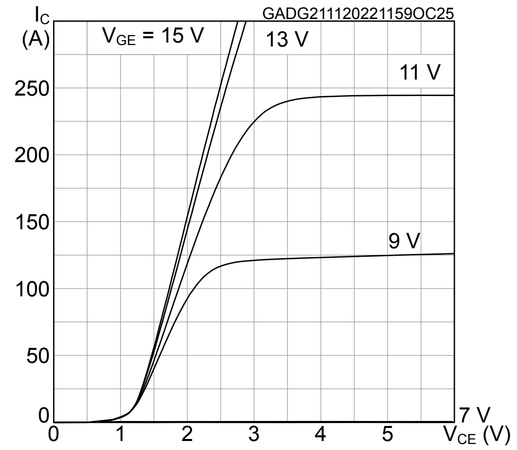


Figure 4. Typical output characteristics (T_J = 175 °C)

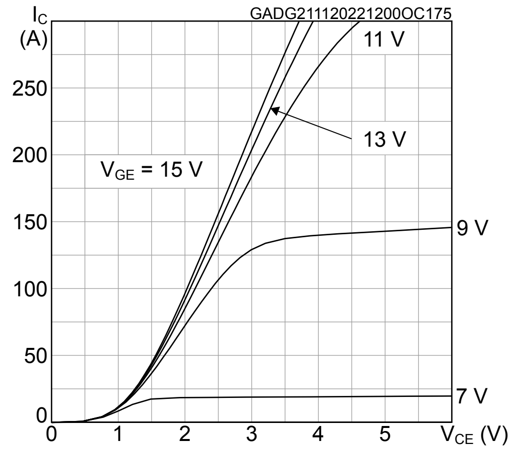


Figure 5. Typical $V_{CE(sat)}$ vs temperature

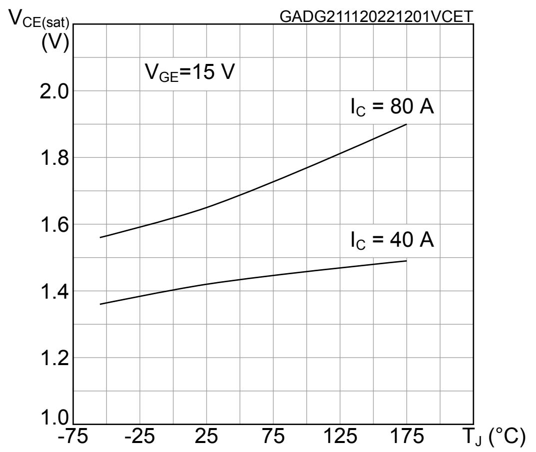


Figure 6. Typical $V_{CE(sat)}$ vs collector current

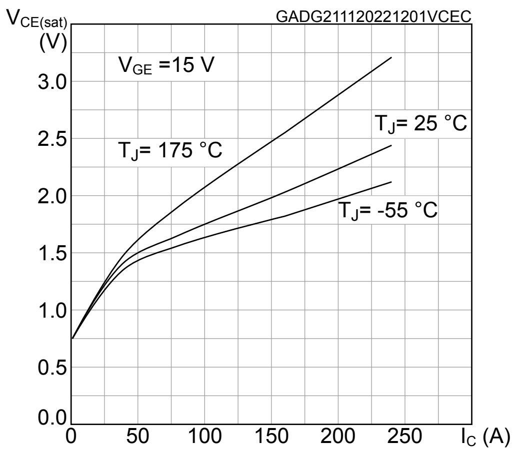


Figure 7. Forward bias safe operating area

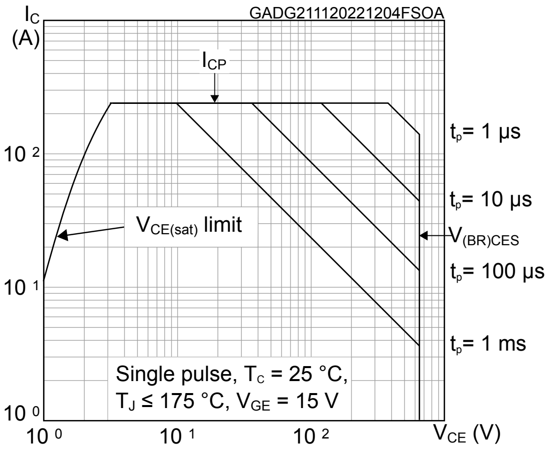


Figure 8. Collector current vs switching frequency

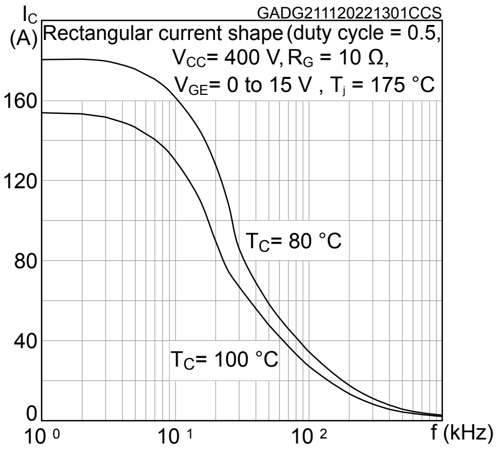


Figure 9. Typical transfer characteristics

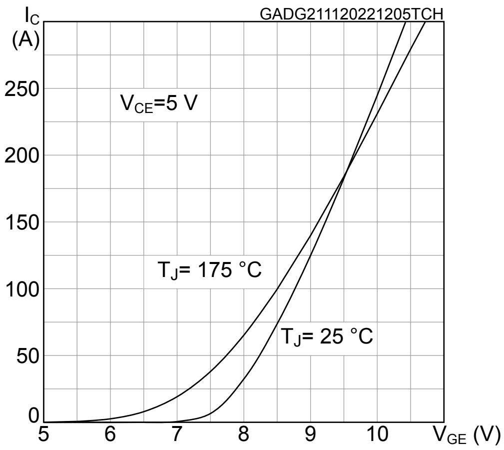


Figure 10. Normalized $V_{GE(th)}$ vs temperature

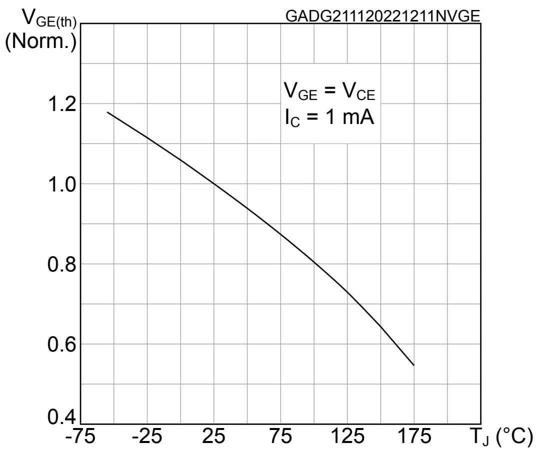


Figure 11. Normalized $V_{(BR)CES}$ vs temperature

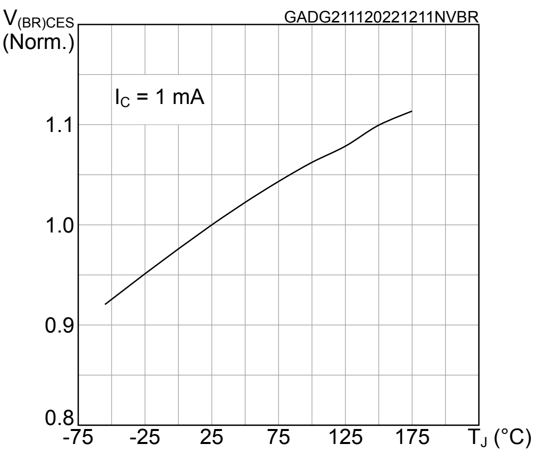


Figure 12. Typical capacitance characteristics

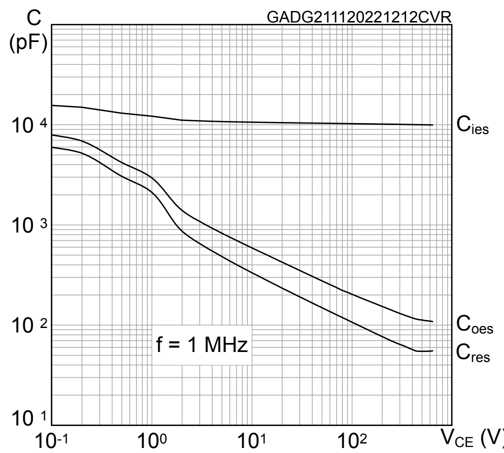


Figure 13. Typical gate charge characteristics

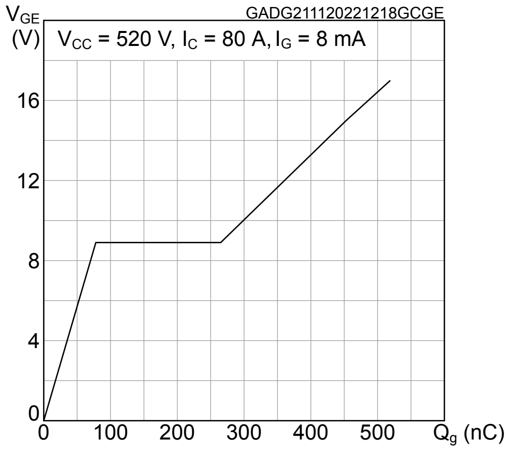


Figure 14. Typical switching energy vs collector current

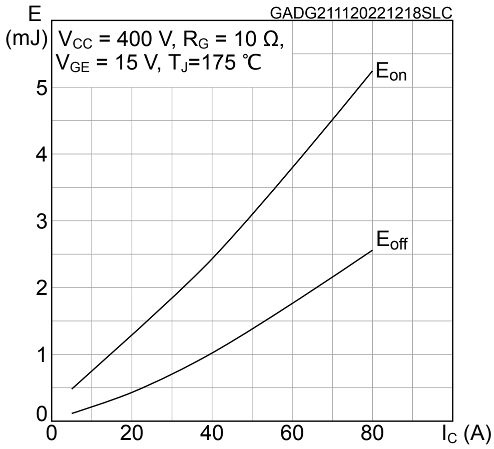


Figure 15. Typical switching energy vs temperature

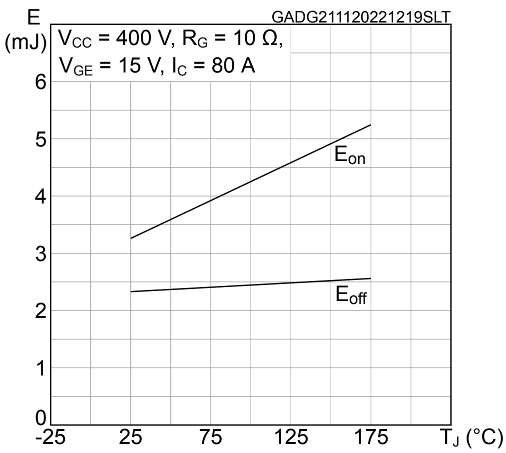


Figure 16. Typical switching energy vs collector emitter voltage

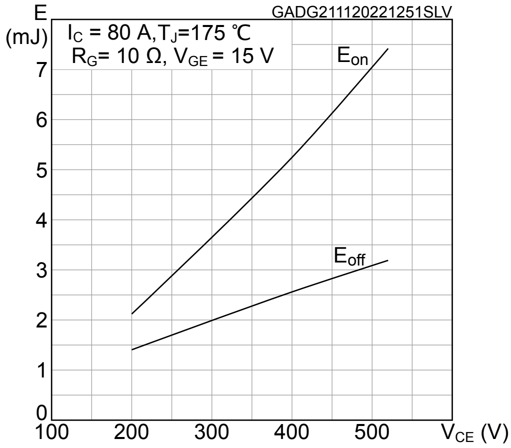


Figure 17. Typical switching energy vs R_G

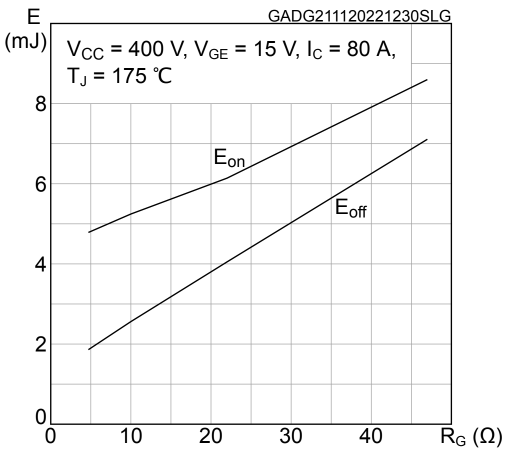
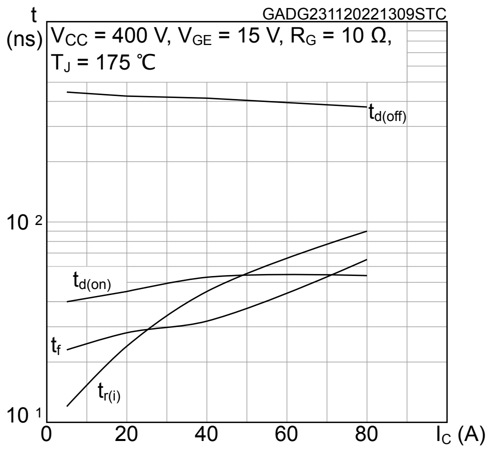


Figure 18. Typical switching times vs collector current



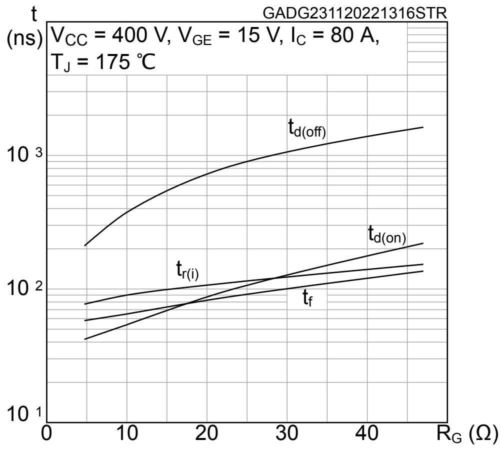


Figure 19. Typical switching times vs gate resistance

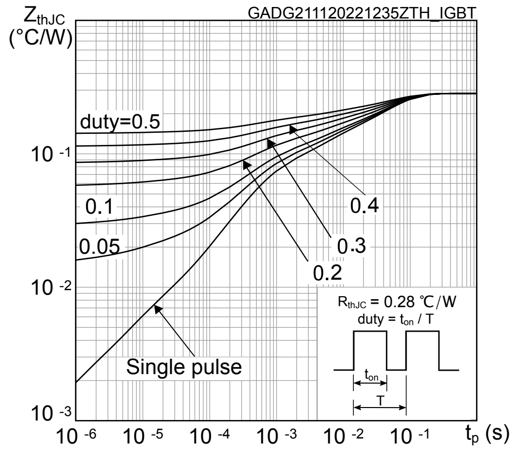


Figure 20. Maximum transient thermal impedance

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-247 long leads package information

Figure 21. TO-247 long leads package outline

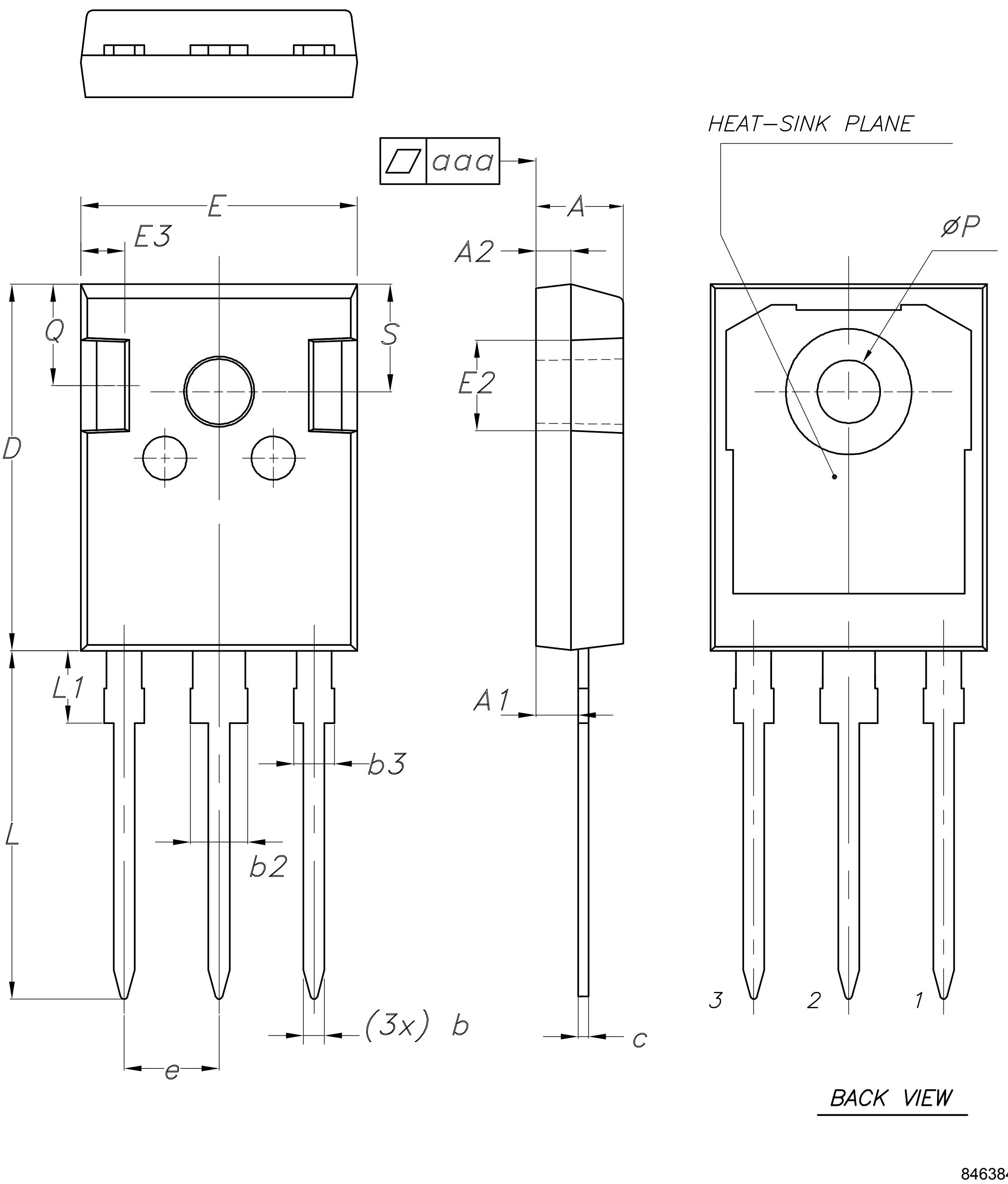


Table 6. **TO-247 long leads package mechanical data**

Dim.	mm		
	Min.	Typ.	Max.
A	4.90	5.00	5.10
A1	2.31	2.41	2.51
A2	1.90	2.00	2.10
b	1.16		1.26
b2			3.25
b3			2.25
c	0.59		0.66
D	20.90	21.00	21.10
E	15.70	15.80	15.90
E2	4.90	5.00	5.10
E3	2.40	2.50	2.60
e	5.34	5.44	5.54
L	19.80	19.92	20.10
L1			4.30
P	3.50	3.60	3.70
Q	5.60		6.00
S	6.05	6.15	6.25
aaa		0.04	0.10

Revision history

Table 7. **Document revision history**

Date	Revision	Changes
16-Feb-2023	1	First release.

Contents