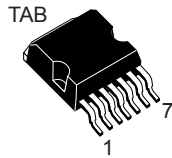
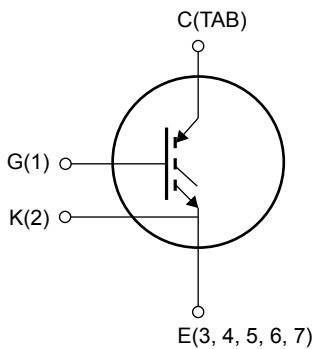


Automotive-grade trench gate field-stop 650 V, 50 A high-speed HB2 series IGBT in an H2PAK-7 package




H2PAK-7



IGBTG1K2E34567CTAB_no_diode



Features

- AEC-Q101 qualified 
- Maximum junction temperature: $T_J = 175\text{ °C}$
- High speed switching series
- Minimized tail current
- Low $V_{CE(sat)} = 1.6\text{ V (typ.) @ } I_C = 50\text{ A}$
- Tight parameter distribution
- Low thermal resistance
- Positive $V_{CE(sat)}$ temperature coefficient
- Excellent switching performance thanks to the extra driving kelvin pin

Application

- On board charger (OBC)
- PFC converter - single phase input
- LLC resonant converter
- High frequency converters

Description

The newest IGBT 650 V HB2 series represents an evolution of the advanced proprietary trench gate field-stop structure. The performance of the HB2 series is optimized in terms of conduction, thanks to a better $V_{CE(sat)}$ behavior at low current values, as well as in terms of reduced switching energy.

Product status link

[STGH50H65B2-7AG](#)

Product summary

Order code	STGH50H65B2-7AG
Marking	G50H65B2AG
Package	H2PAK-7
Packing	Tape and reel

1 Electrical ratings

$T_J = 25\text{ °C}$ unless otherwise specified.

Table 1. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{CES}	Collector-emitter voltage ($V_{GE} = 0\text{ V}$)	650	V
I_C	Continuous collector current at $T_C = 25\text{ °C}$	108 ⁽¹⁾	A
	Continuous collector current at $T_C = 100\text{ °C}$	68	
$I_{CP}^{(2)}$	Pulsed collector current ($t_p \leq 1\ \mu\text{s}$, $T_J < 175\text{ °C}$)	200	A
V_{GE}	Gate-emitter voltage	± 20	V
	Transient gate-emitter voltage ($t_p \leq 10\ \mu\text{s}$)	± 30	
P_{TOT}	Total power dissipation at $T_C = 25\text{ °C}$	385	W
T_{STG}	Storage temperature range	-55 to 150	°C
T_J	Operating junction temperature range	-55 to 175	°C

1. Limited by package.

2. Defined by R_{thJC} and limited by maximum junction temperature, not tested in production.

Table 2. Thermal data

Symbol	Parameter	Value	Unit
R_{thJC}	Thermal resistance, junction-to-case	0.39	°C/W
R_{thJA}	Thermal resistance, junction-to-ambient	50	°C/W

2 Electrical characteristics

$T_J = 25\text{ °C}$ unless otherwise specified.

Table 3. Static characteristics

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)CES}$	Collector-emitter breakdown voltage	$V_{GE} = 0\text{ V}$, $I_C = 1\text{ mA}$	650			V
$V_{CE(sat)}$	Collector-emitter saturation voltage	$V_{GE} = 15\text{ V}$, $I_C = 50\text{ A}$		1.6	2.0	V
		$V_{GE} = 15\text{ V}$, $I_C = 50\text{ A}$, $T_J = 125\text{ °C}$		1.8		
		$V_{GE} = 15\text{ V}$, $I_C = 50\text{ A}$, $T_J = 175\text{ °C}$		1.9		
$V_{GE(th)}$	Gate threshold voltage	$V_{CE} = V_{GE}$, $I_C = 1\text{ mA}$	5	6	7	V

Table 4. Dynamic characteristics

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{ies}	Input capacitance	$V_{CE} = 25\text{ V}$, $f = 1\text{ MHz}$, $V_{GE} = 0\text{ V}$	-	2928	-	pF
C_{oes}	Output capacitance		-	387	-	pF
C_{res}	Reverse transfer capacitance		-	73	-	pF
Q_g	Total gate charge	$V_{CC} = 520\text{ V}$, $I_C = 50\text{ A}$, $V_{GE} = 0\text{ to }15\text{ V}$ (see Figure 20. Gate charge test circuit)	-	152	-	nC
Q_{ge}	Gate-emitter charge		-	21	-	nC
Q_{gc}	Gate-collector charge		-	70	-	nC

Table 5. IGBT switching characteristics (inductive load)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(off)}$	Turn-off delay time	$V_{CE} = 400\text{ V}$, $I_C = 50\text{ A}$, $V_{GE} = 15\text{ V}$, $R_G = 4.7\text{ }\Omega$ (see Figure 19. Test circuit for inductive load switching)	-	116	-	ns
t_f	Current fall time		-	39	-	ns
$E_{off}^{(1)}$	Turn-off switching energy		-	527	-	μJ
$t_{d(off)}$	Turn-off delay time	$V_{CE} = 400\text{ V}$, $I_C = 50\text{ A}$, $V_{GE} = 15\text{ V}$, $R_G = 4.7\text{ }\Omega$, $T_J = 175\text{ °C}$ (see Figure 19. Test circuit for inductive load switching)	-	137	-	ns
t_f	Current fall time		-	77	-	ns
$E_{off}^{(1)}$	Turn-off switching energy		-	911	-	μJ

1. Including the tail of the collector current.

2.1 Electrical characteristics (curves)

Figure 1. Total power dissipation vs temperature

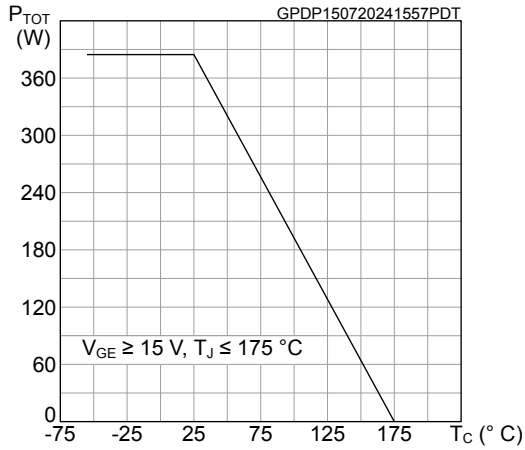


Figure 2. Collector current vs temperature

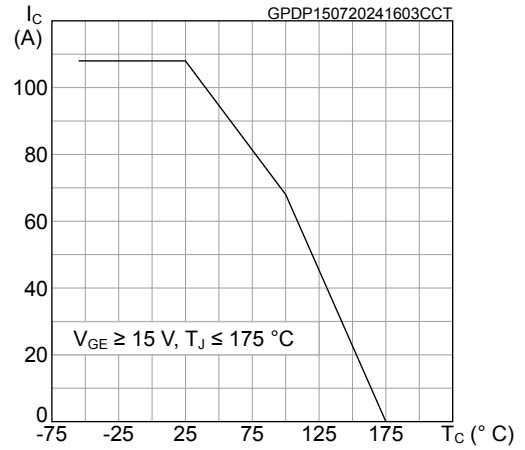


Figure 3. Typical output characteristics ($T_J = 25^\circ\text{C}$)

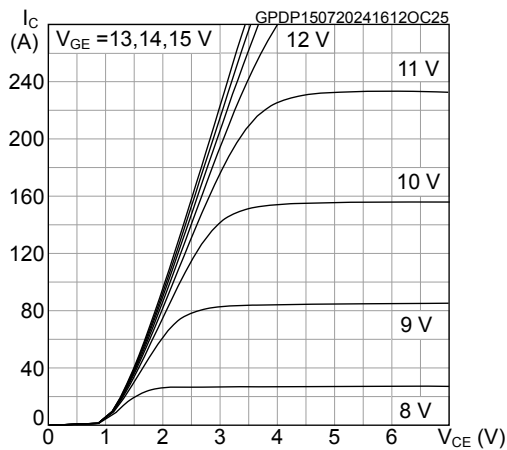


Figure 4. Typical output characteristics ($T_J = 175^\circ\text{C}$)

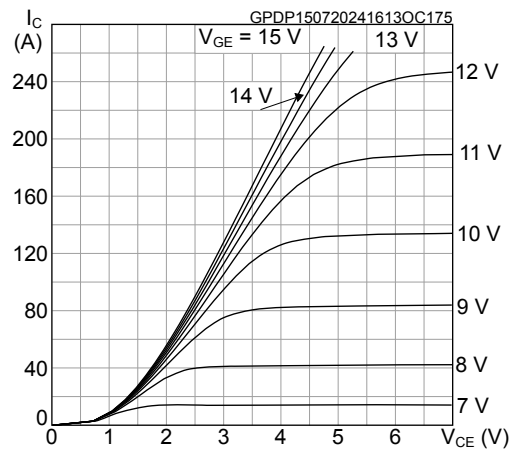


Figure 5. Typical transfer characteristics

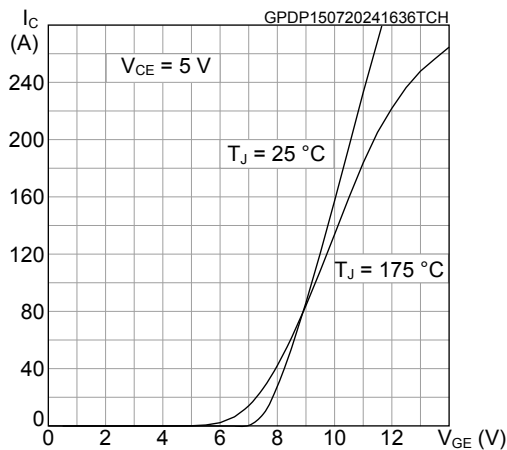


Figure 6. Typical $V_{CE(sat)}$ vs temperature

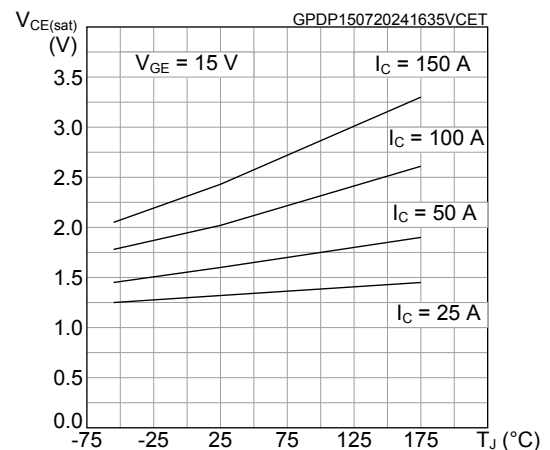


Figure 7. Typical $V_{CE(sat)}$ vs collector current

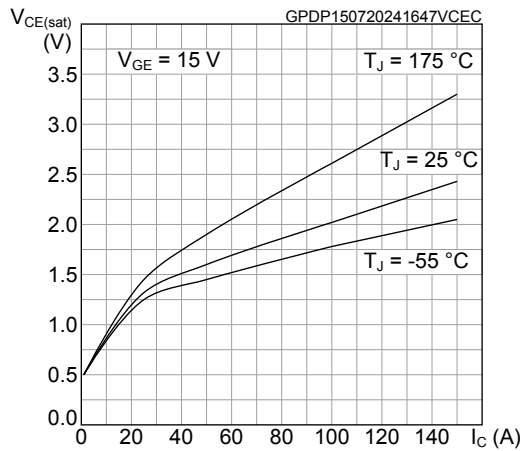


Figure 8. Forward bias safe operating area

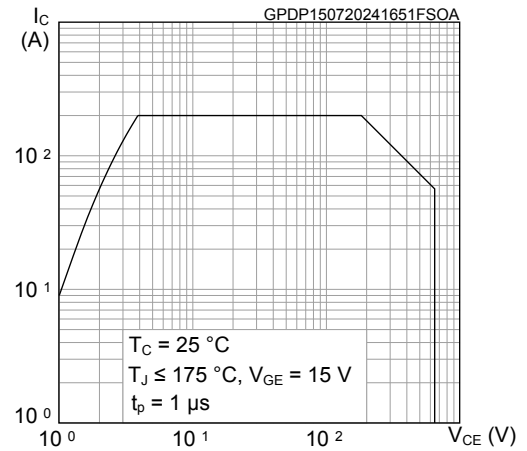


Figure 9. Normalized gate threshold vs temperature

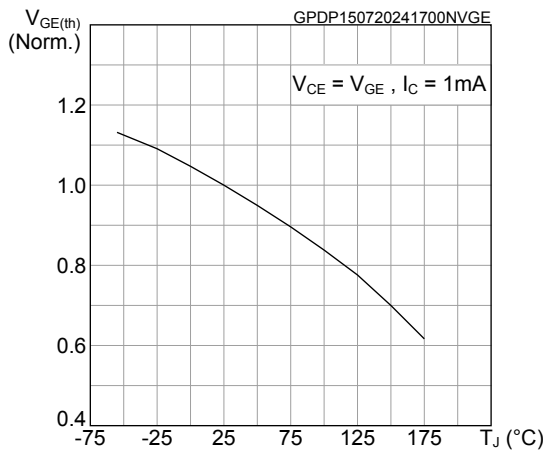


Figure 10. Typical capacitance characteristics

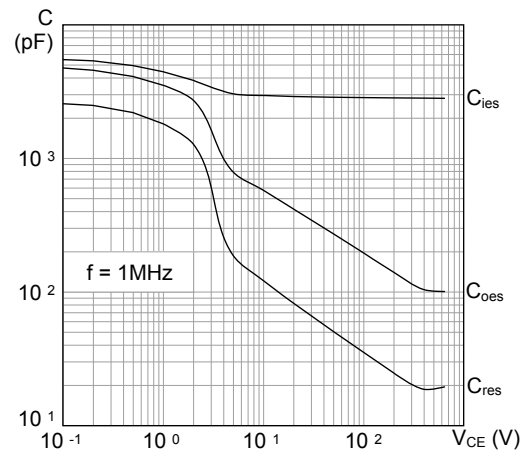


Figure 11. Typical gate charge characteristics

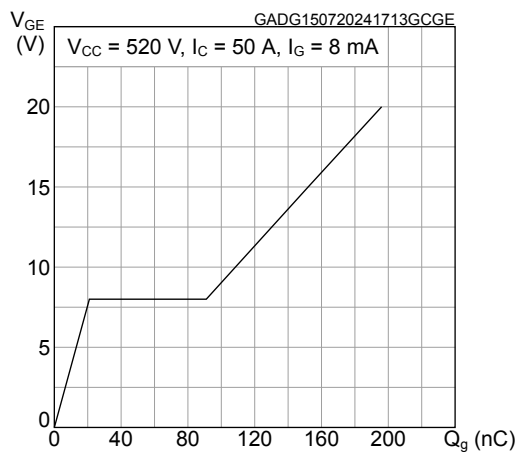


Figure 12. Typical switching energy vs collector current

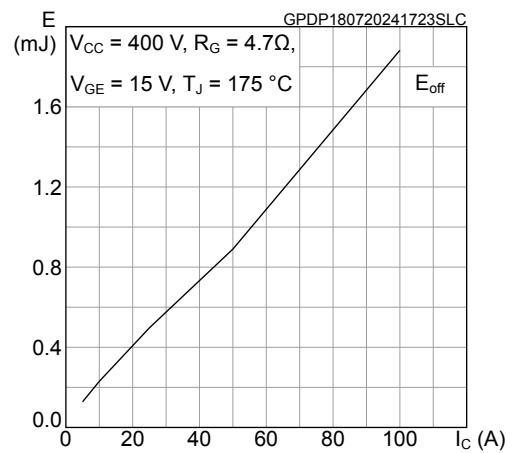


Figure 13. Typical switching energy vs temperature

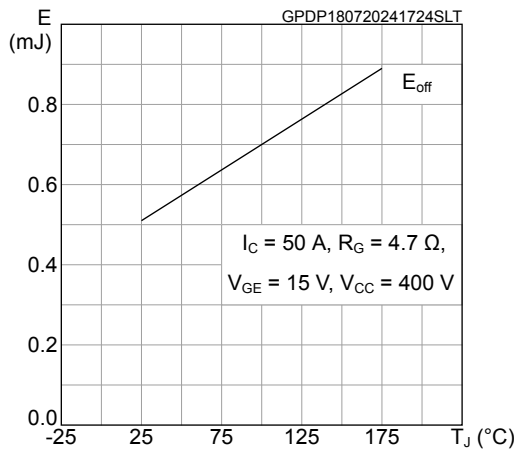


Figure 14. Typical switching energy vs supply voltage

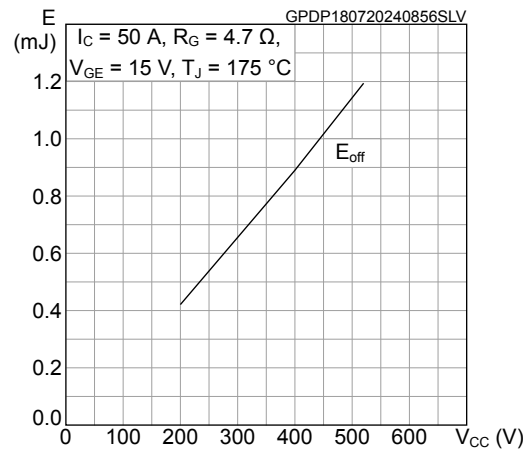


Figure 15. Typical switching energy vs gate resistance

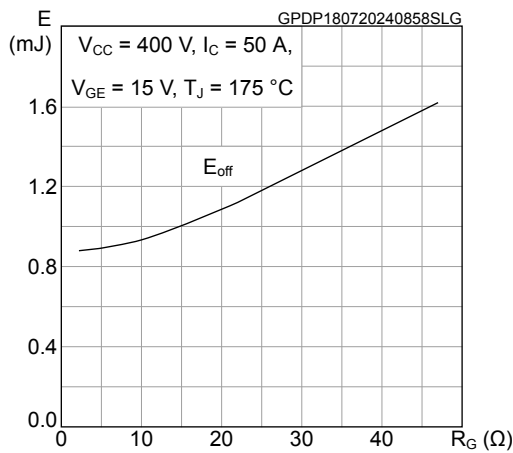


Figure 16. Typical switching times vs collector current

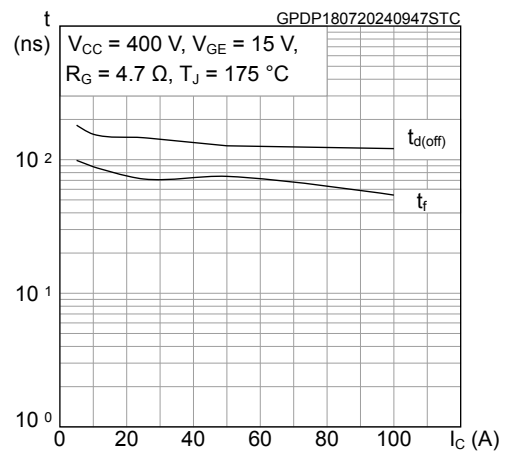


Figure 17. Typical switching times vs gate resistance

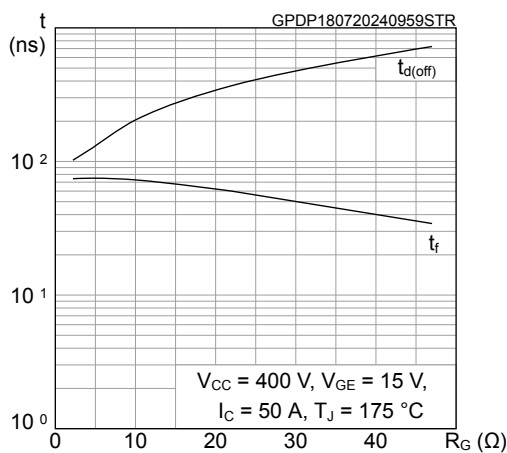
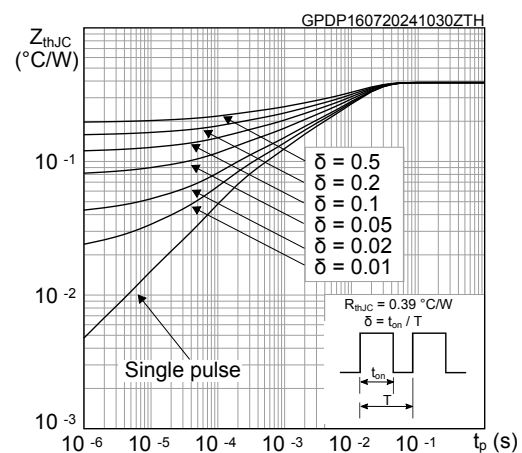
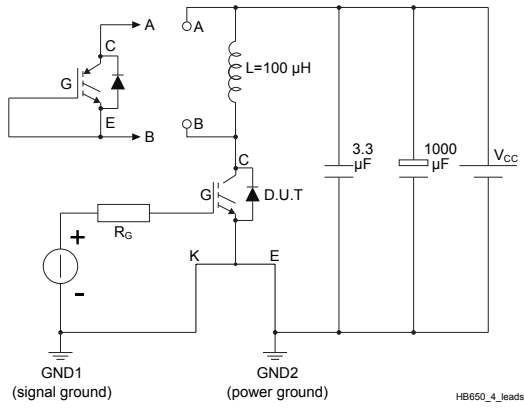
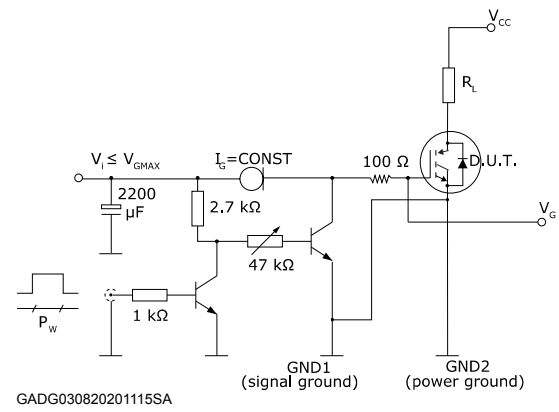
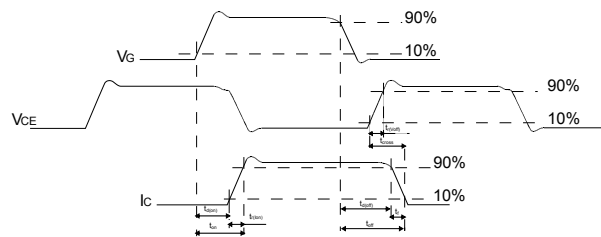


Figure 18. Maximum transient thermal impedance



3 Test circuits

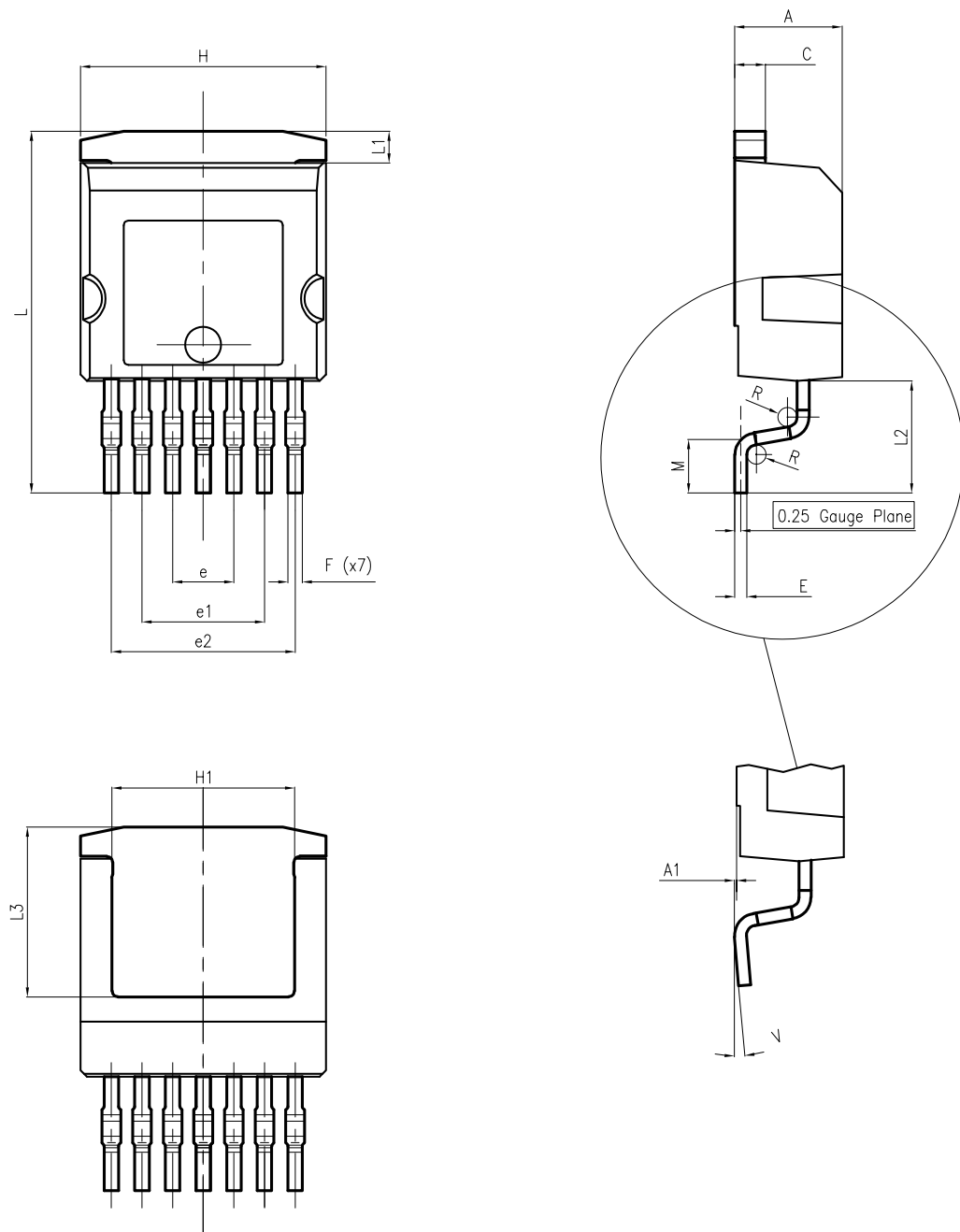
Figure 19. Test circuit for inductive load switching

Figure 20. Gate charge test circuit

Figure 21. Switching waveform


4 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.

4.1 H²PAK-7 package information

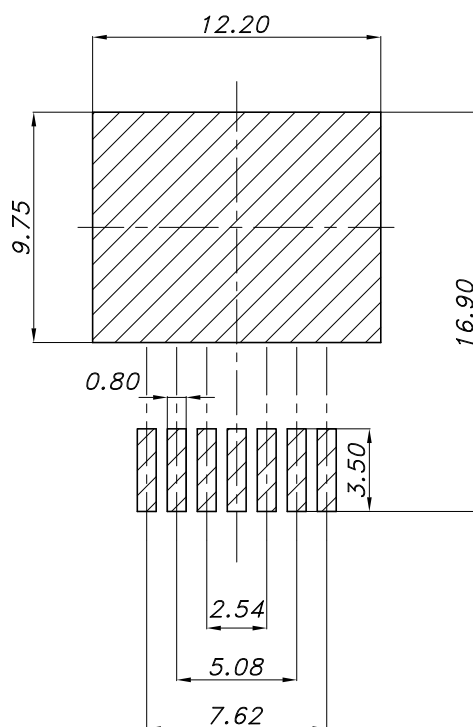
Figure 22. H²PAK-7 package outline



DM00249216_6

Table 6. H²PAK-7 package mechanical data

Dim.	mm	
	Min.	Max.
A	4.30	4.80
A1	0.03	0.20
C	1.17	1.37
e	2.34	2.74
e1	4.88	5.28
e2	7.42	7.82
E	0.45	0.60
F	0.50	0.70
H	10.00	10.40
H1	7.40	8.00
L	14.75	15.25
L1	1.27	1.40
L2	4.35	4.95
L3	6.85	7.25
M	1.90	2.50
R	0.20	0.60
V	0°	8°

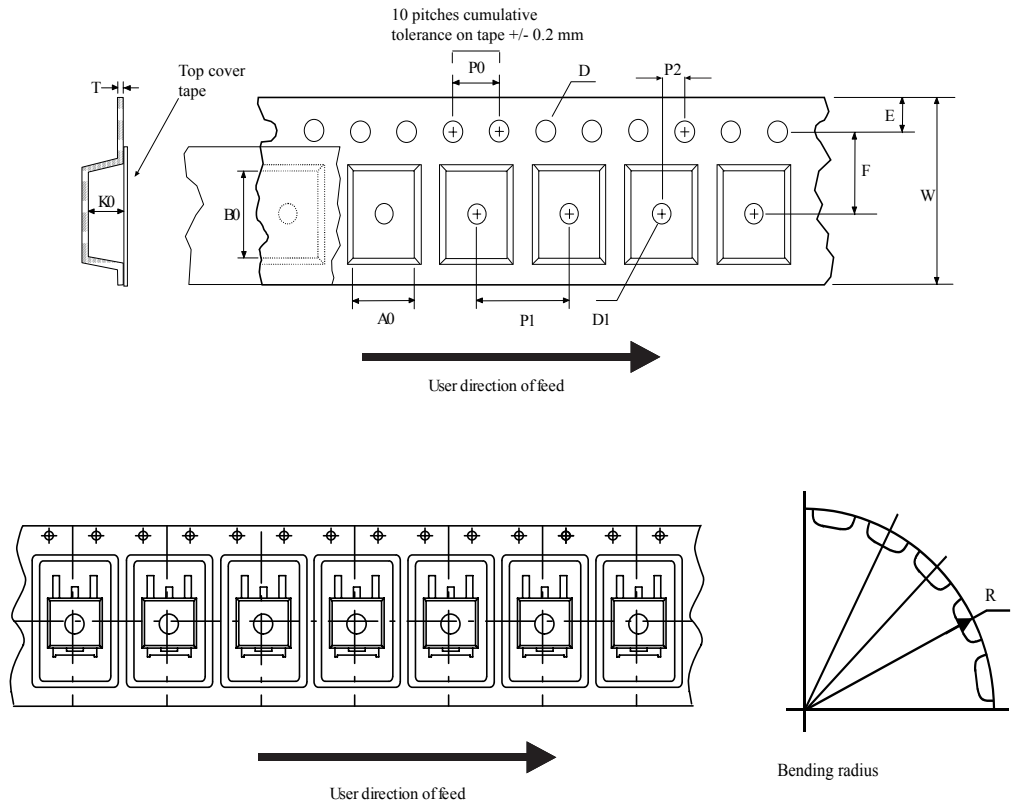
Figure 23. H²PAK-7 recommended footprint


footprint_DM00249216_6

Note: Dimensions are in mm.

4.2 Packing information

Figure 24. Tape outline



AM08852v2

Figure 25. Reel outline

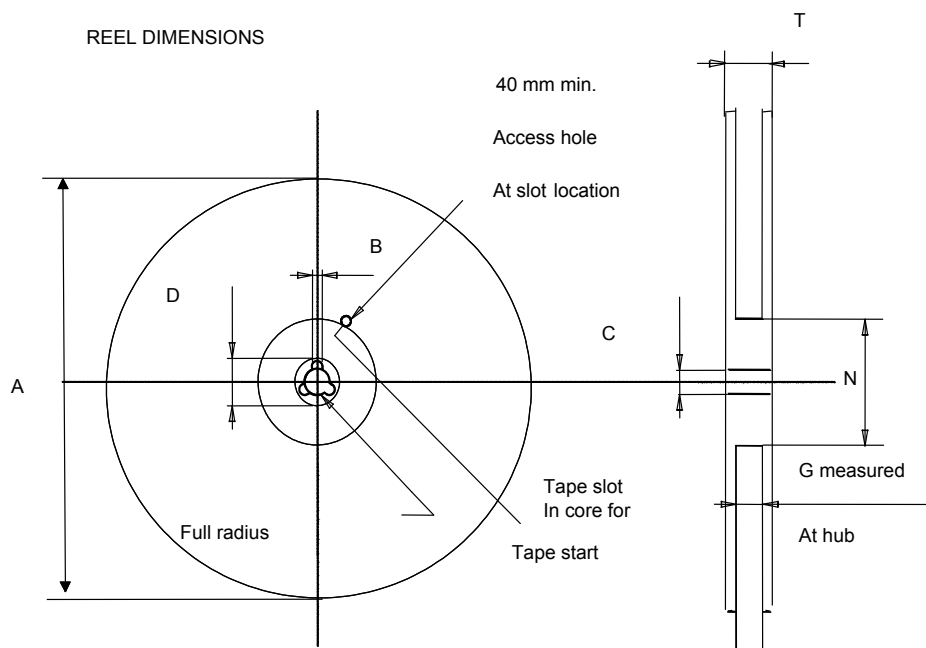


Table 7. Tape and reel mechanical data

Tape			Reel		
Dim.	mm		Dim.	mm	
	Min.	Max.		Min.	Max.
A0	10.5	10.7	A		330
B0	15.7	15.9	B	1.5	
D	1.5	1.6	C	12.8	13.2
D1	1.59	1.61	D	20.2	
E	1.65	1.85	G	24.4	26.4
F	11.4	11.6	N	100	
K0	4.8	5.0	T		30.4
P0	3.9	4.1			
P1	11.9	12.1	Base quantity		1000
P2	1.9	2.1	Bulk quantity		1000
R	50				
T	0.25	0.35			
W	23.7	24.3			

Revision history

Table 8. Document revision history

Date	Revision	Changes
18-Jul-2024	1	First release.

Contents

1	Electrical ratings	2
2	Electrical characteristics	3
2.1	Electrical characteristics (curves)	4
3	Test circuits	7
4	Package information	8
4.1	H ² PAK-7 package information	8
4.2	Packing information	10
	Revision history	12

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