

1 Electrical ratings

Table 1. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source voltage	80	V
V_{GS}	Gate-source voltage	± 20	V
$I_D^{(1)}$	Drain current (continuous) at $T_C = 25\text{ }^\circ\text{C}$	180	A
$I_D^{(1)}$	Drain current (continuous) at $T_C = 100\text{ }^\circ\text{C}$	180	A
$I_{DM}^{(2)}$	Drain current (pulsed)	720	A
$P_{TOT}^{(3)}$	Total power dissipation at $T_C = 25\text{ }^\circ\text{C}$	315	W
$E_{AS}^{(4)}$	Single pulse avalanche energy	1.16	J
T_j	Operating junction temperature range	-55 to 175	$^\circ\text{C}$
T_{stg}	Storage temperature range		

1. Current limited by package.
2. Pulse width limited by safe operating area.
3. This value is rated according to R_{thJC}
4. Starting $T_j=25\text{ }^\circ\text{C}$, $I_D=65\text{ A}$, $V_{DD}=50\text{ V}$

Table 2. Thermal data

Symbol	Parameter	Value		Unit
		H ² PAK-2, H ² PAK-6	TO-220	
R_{thJC}	Thermal resistance, junction-to-case	0.48		$^\circ\text{C/W}$
$R_{thJB}^{(1)}$	Thermal resistance, junction-to-board	35		$^\circ\text{C/W}$
R_{thJA}	Thermal resistance, junction-to-ambient		62.5	$^\circ\text{C/W}$

1. When mounted on an 1 inch² FR-4, 2 Oz copper board.

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	$I_D = 250\text{ }\mu\text{A}$, $V_{GS} = 0\text{ V}$	80			V
I_{DSS}	Zero gate voltage drain current	$V_{GS} = 0\text{ V}$, $V_{DS} = 80\text{ V}$			10	μA
		$V_{GS} = 0\text{ V}$, $V_{DS} = 80\text{ V}$, $T_C = 125\text{ °C}$ ⁽¹⁾			100	μA
I_{GSS}	Gate-body leakage current	$V_{GS} = \pm 20\text{ V}$, $V_{DS} = 0\text{ V}$			100	nA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}$, $I_D = 250\text{ }\mu\text{A}$	2.5		4.5	V
$R_{DS(on)}$	Static drain-source on-resistance	For H ² PAK-2, H ² PAK-6: $V_{GS} = 10\text{ V}$, $I_D = 90\text{ A}$		0.0017	0.0021	Ω
		For TO-220: $V_{GS} = 10\text{ V}$, $I_D = 90\text{ A}$		0.0021	0.0025	

1. Defined by design, not subject to production test.

Table 4. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	$V_{DS} = 50\text{ V}$, $f = 1\text{ MHz}$, $V_{GS} = 0\text{ V}$	-	13600	-	pF
C_{oss}	Output capacitance		-	2050	-	pF
C_{riss}	Reverse transfer capacitance		-	236	-	pF
Q_g	Total gate charge	$V_{DD} = 40\text{ V}$, $I_D = 180\text{ A}$,	-	193	-	nC
Q_{gs}	Gate-source charge	$V_{GS} = 0$ to 10 V	-	96	-	nC
Q_{gd}	Gate-drain charge	(see Figure 20. Test circuit for gate charge behavior)	-	46	-	nC

Table 5. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{DD} = 40\text{ V}$, $I_D = 90\text{ A}$, $R_G = 4.7\text{ }\Omega$, $V_{GS} = 10\text{ V}$ (see Figure 19. Test circuit for resistive load switching times and Figure 24. Switching time waveform)	-	56	-	ns
t_r	Rise time		-	180	-	ns
$t_{d(off)}$	Turn-off delay time		-	98	-	ns
t_f	Fall time		-	42	-	ns

Table 6. Source-drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain current		-		180	A
$I_{SDM}^{(1)}$	Source-drain current (pulsed)		-		720	A
$V_{SD}^{(2)}$	Source-drain current	$I_{SD} = 90\text{ A}, V_{GS} = 0\text{ V}$	-		1.2	V
t_{rr}	Reverse recovery time	$I_{SD} = 180\text{ A}, di/dt = 100\text{ A}/\mu\text{s}$	-	78		ns
Q_{rr}	Reverse recovery charge	$V_{DD} = 64\text{ V}, T_J = 150\text{ }^\circ\text{C}$ (see Figure 21. Test circuit for inductive load switching and diode recovery times)	-	182		nC
I_{RRM}	Reverse recovery current		-	4.7		A

1. Pulse width limited by safe operating area.

2. Pulsed: pulse duration=300 μs , duty cycle 1.5%.

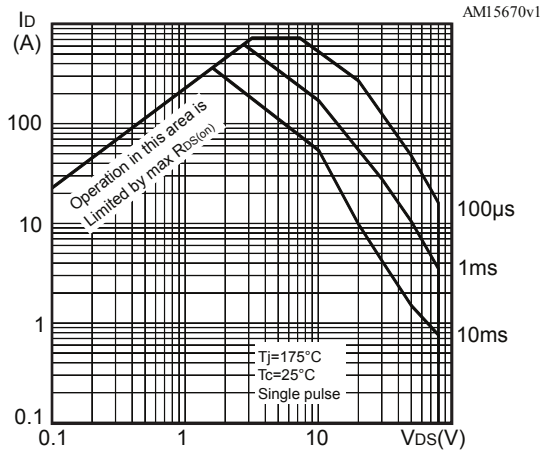
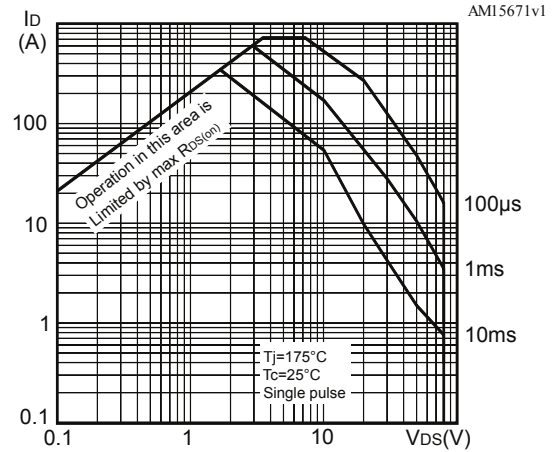
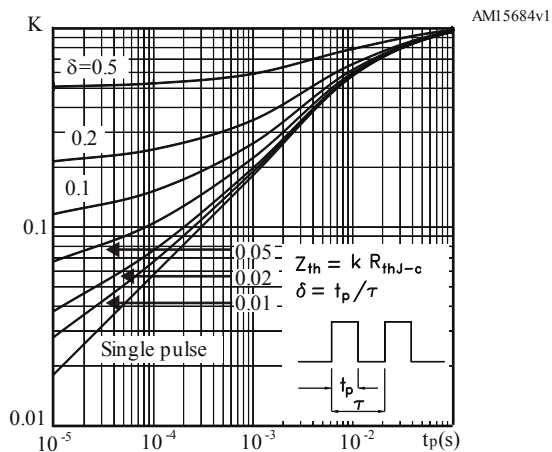
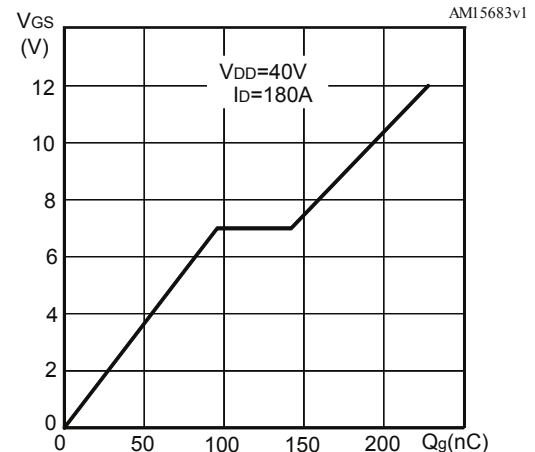
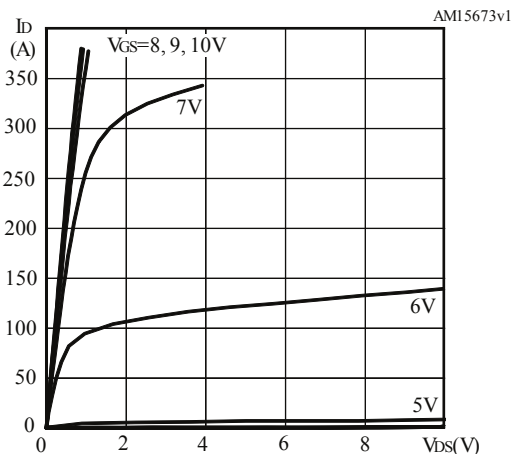
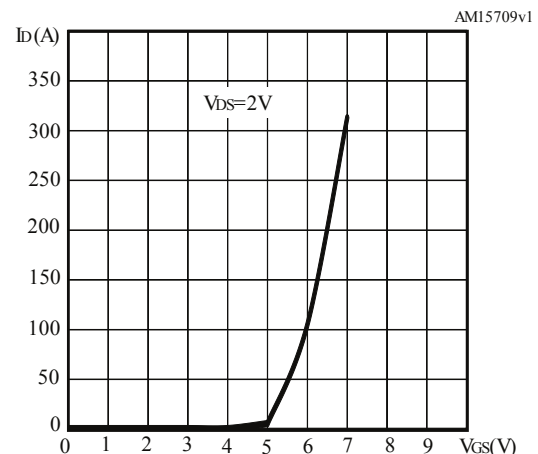
2.1 Electrical characteristics (curves)
Figure 1. Safe operating area for H²PAK-2 and H²PAK-6

Figure 2. Safe operating area for TO-220

Figure 3. Normalized transient thermal impedance

Figure 4. Typical gate charge characteristics

Figure 5. Typical output characteristics for TO-220

Figure 6. Typical transfer characteristics for TO-220


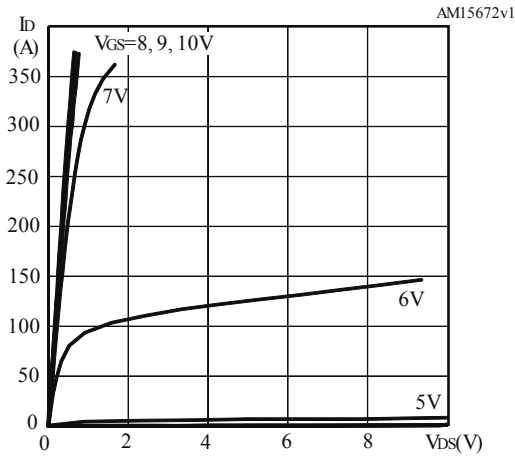
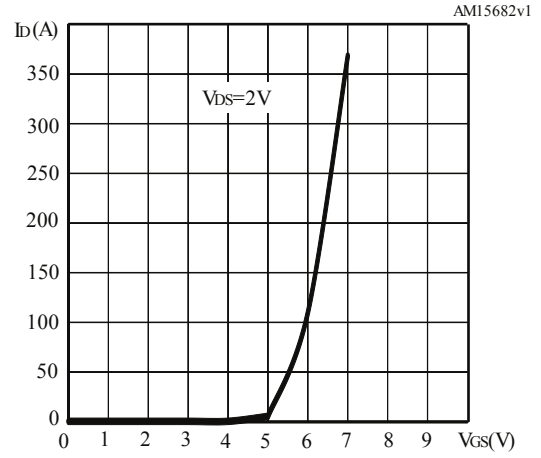
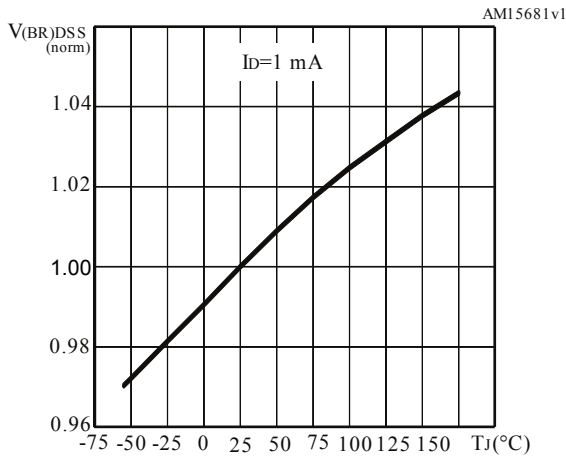
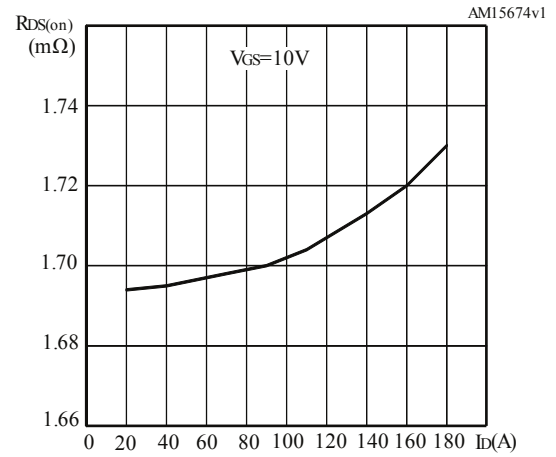
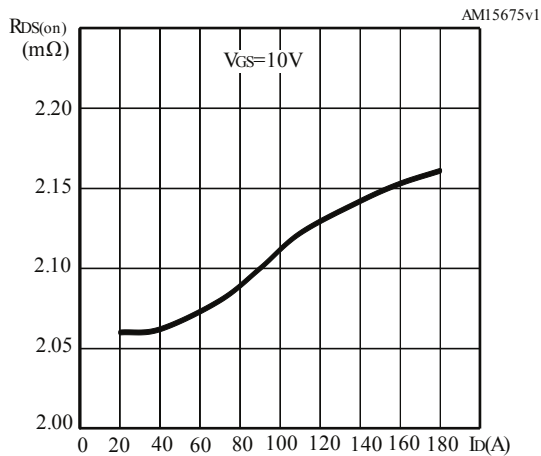
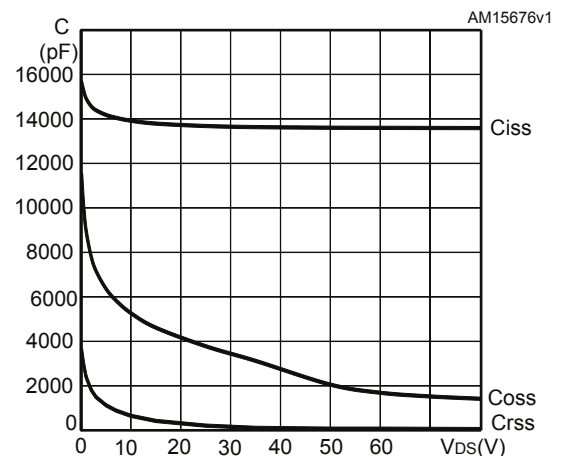
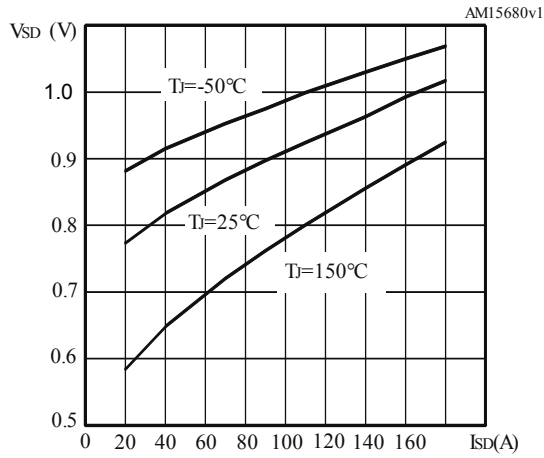
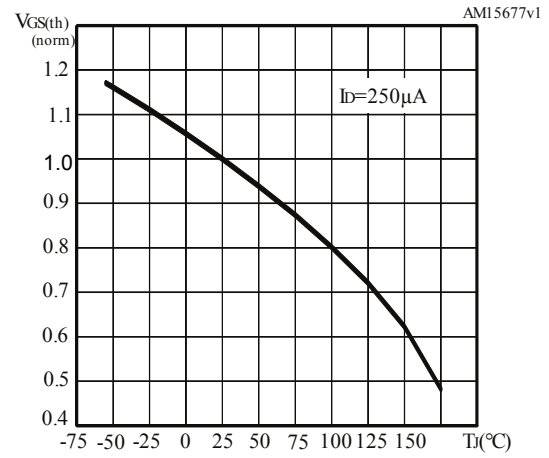
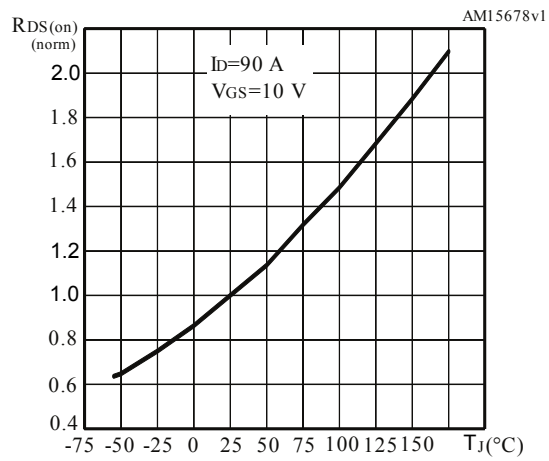
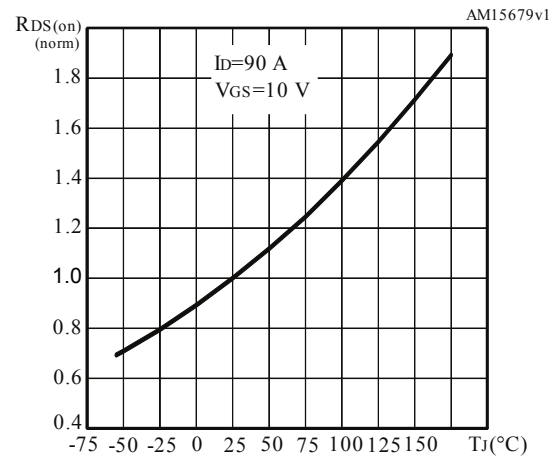
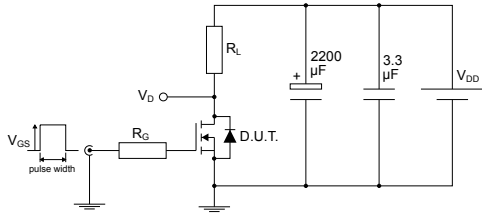
Figure 7. Typical output characteristics for H²PAK-2 and H²PAK-6

Figure 8. Typical transfer characteristics for H²PAK-2 and H²PAK-6

Figure 9. Normalized breakdown voltage vs temperature

Figure 10. Typical drain-source on-resistance for H²PAK-2 and H²PAK-6

Figure 11. Typical drain-source on-resistance for TO-220

Figure 12. Typical capacitance characteristics


Figure 13. Typical reverse diode forward characteristics

Figure 14. Normalized gate threshold vs temperature

Figure 15. Normalized on-resistance vs temperature for H²PAK-2 and H²PAK-6

Figure 16. Normalized on-resistance vs temperature for TO-220


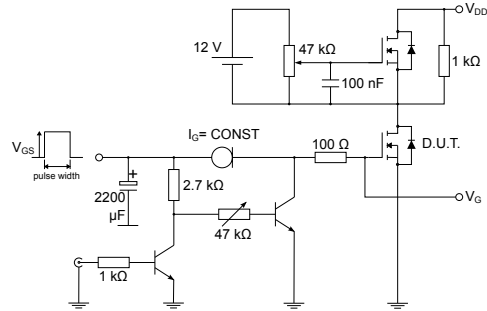
3 Test circuits

Figure 17. Test circuit for resistive load switching times



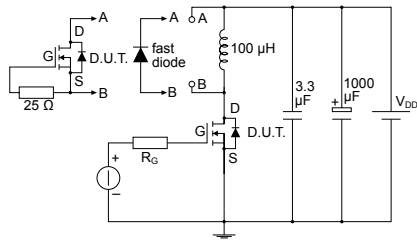
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Figure 18. Test circuit for gate charge behavior



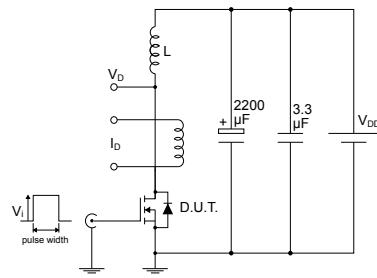
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Figure 19. Test circuit for inductive load switching and diode recovery times



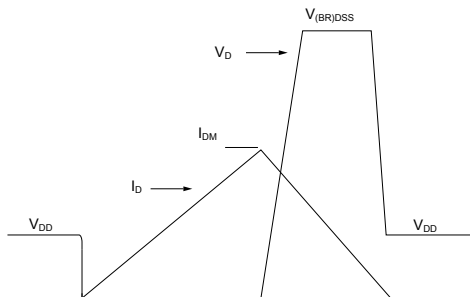
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Figure 20. Unclamped inductive load test circuit



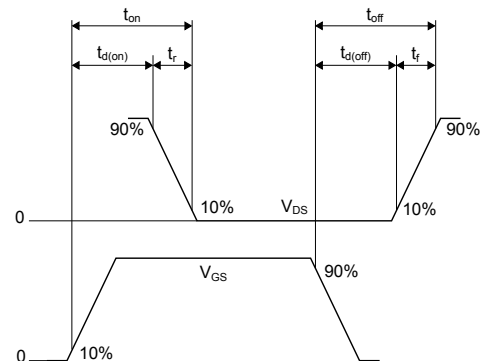
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Figure 21. Unclamped inductive waveform



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Figure 22. Switching time waveform



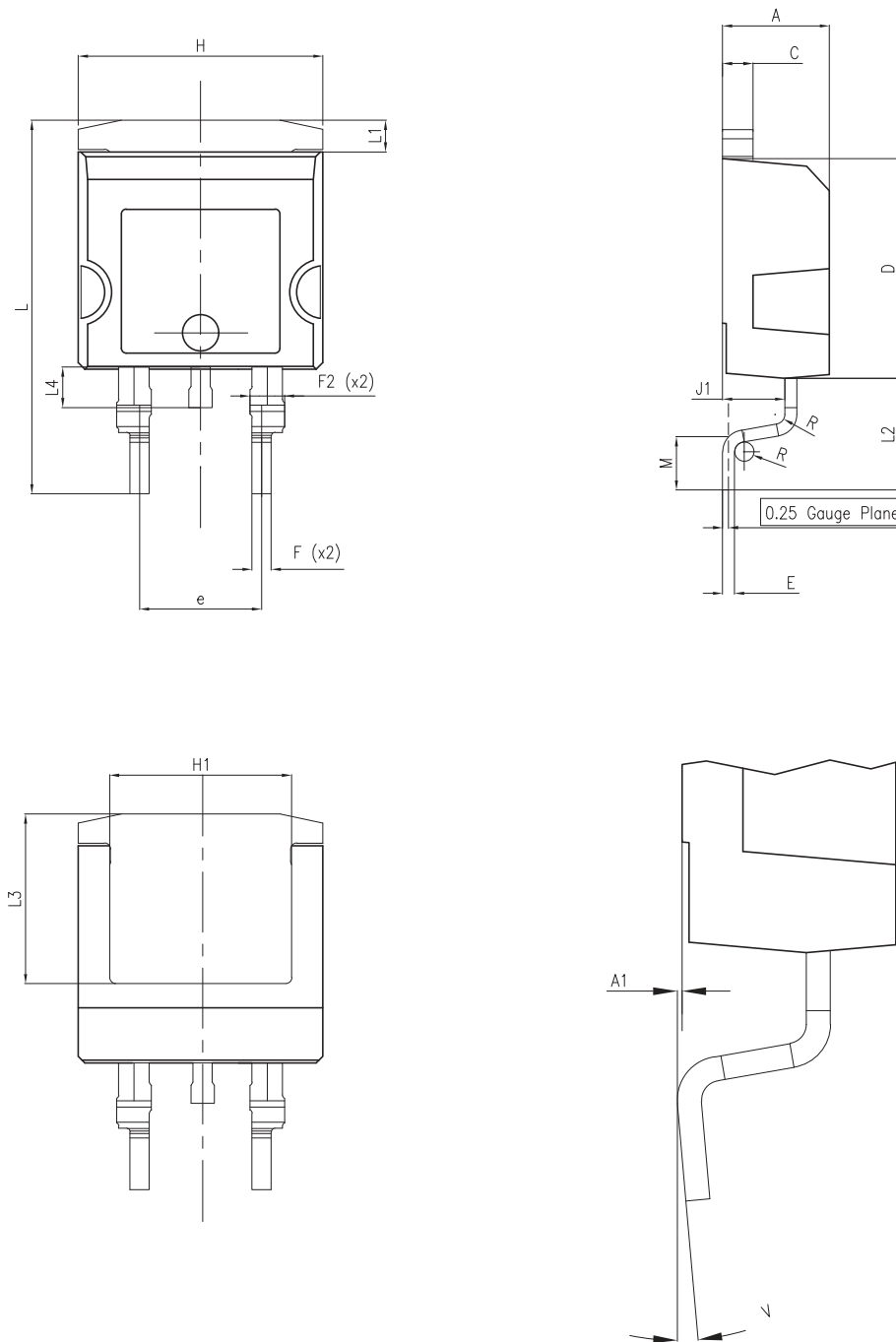
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4 Package information

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-2 package information

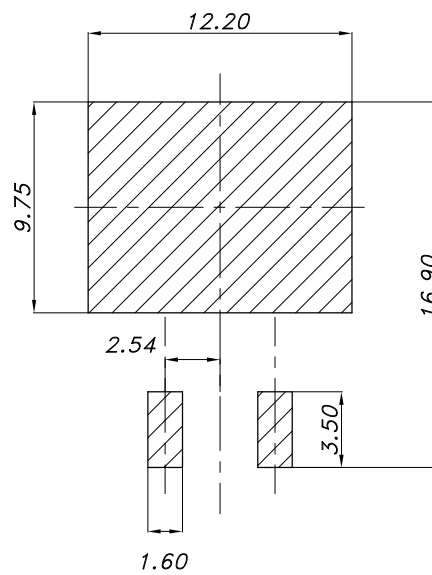
Figure 23. H²PAK-2 package outline



8159712_9

Table 7. H²PAK-2 package mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	4.30		4.70
A1	0.03		0.20
C	1.17		1.37
D	8.95		9.35
e	4.98		5.18
E	0.50		0.90
F	0.78		0.85
F2	1.14		1.70
H	10.00		10.40
H1	7.40	-	7.80
J1	2.49		2.69
L	15.30		15.80
L1	1.27		1.40
L2	4.93		5.23
L3	6.85		7.25
L4	1.50		1.70
M	2.60		2.90
R	0.20		0.60
V	0°		8°

Figure 24. H²PAK-2 recommended footprint


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Note: Dimensions are in mm.

4.2 H²PAK-6 package information

Figure 25. H²PAK-6 package outline

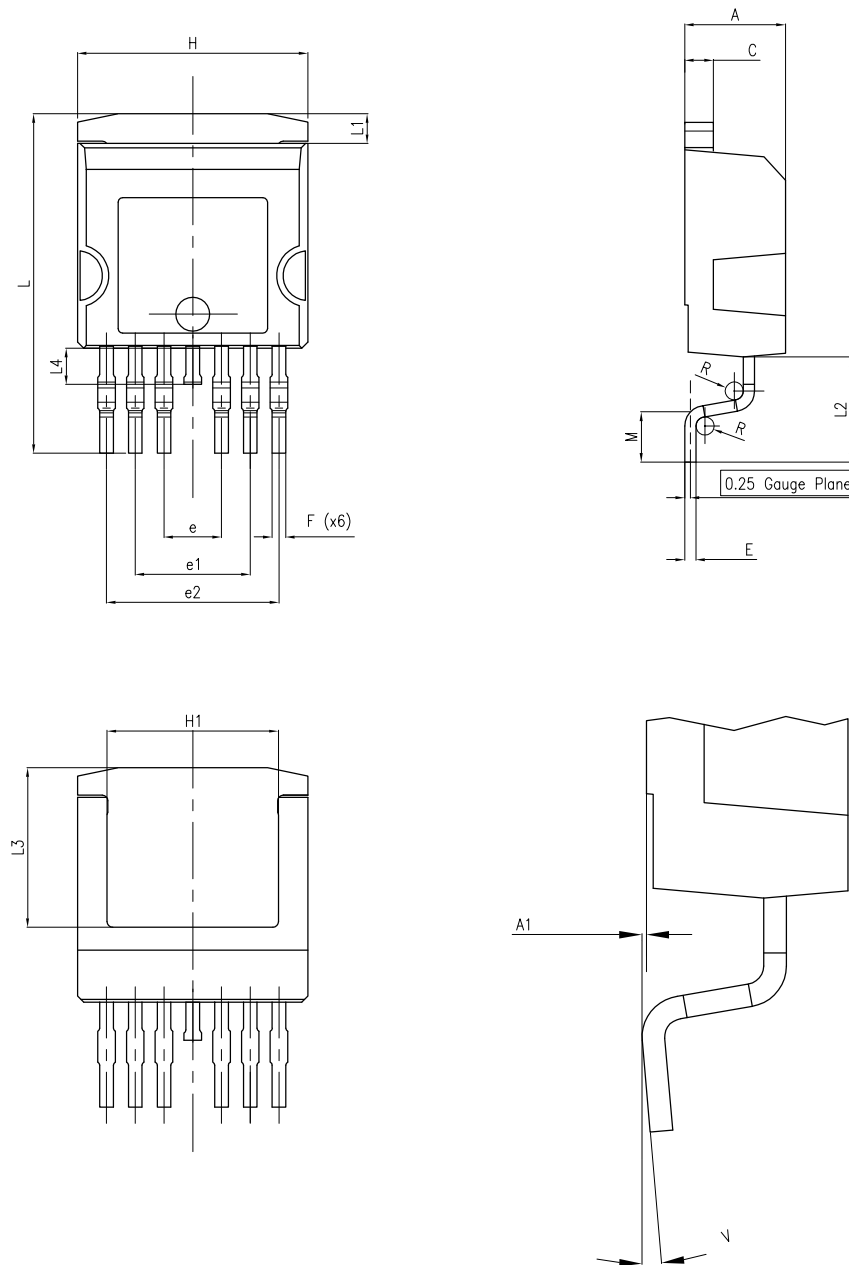
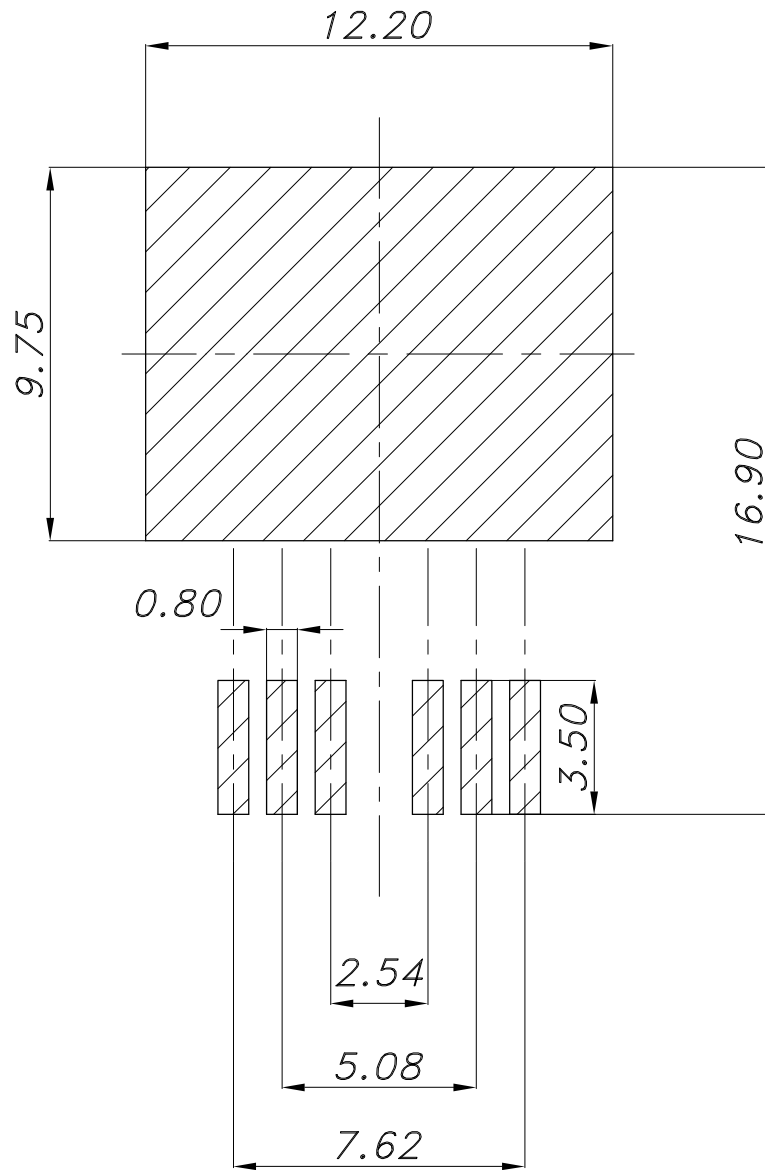


Table 8. H²PAK-6 package mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	4.30		4.70
A1	0.03		0.20
C	1.17		1.37
e	2.34	2.54	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		7.80
L	14.75		15.25
L1	1.27		1.40
L2	4.35		4.95
L3	6.85		7.25
L4	1.50		1.75
M	1.90		2.50
R	0.20		0.60
V	0°		8°

Figure 26. H²PAK-6 recommended footprint

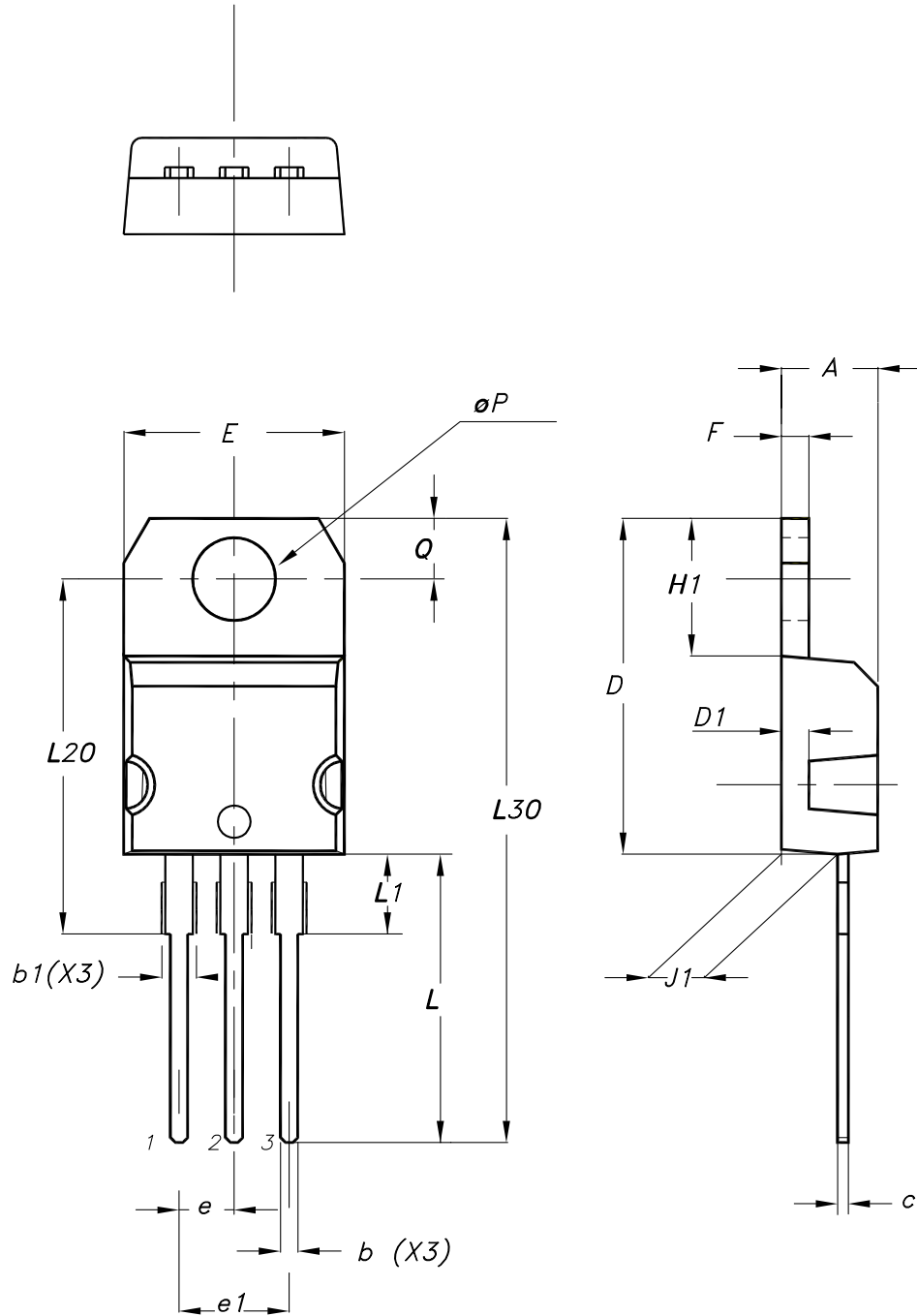


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Note: Dimensions are in mm.

4.3 TO-220 type A package information

Figure 27. TO-220 type A package outline



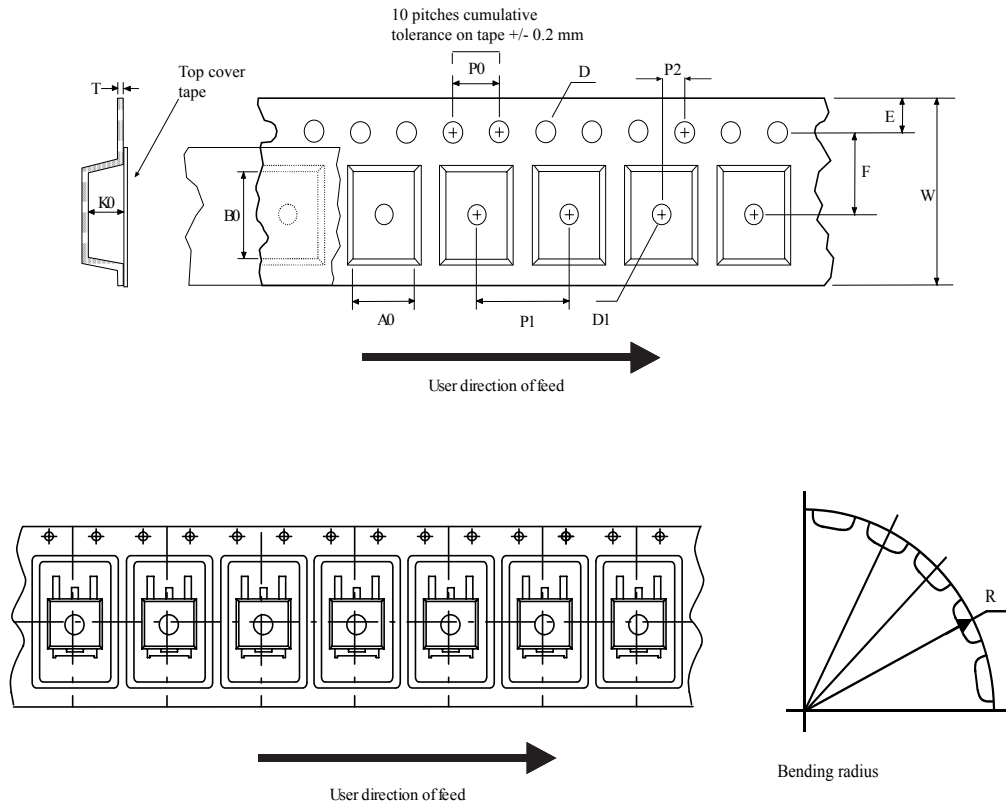
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Table 9. TO-220 type A package mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	4.40		4.60
b	0.61		0.88
b1	1.14		1.55
c	0.48		0.70
D	15.25		15.75
D1		1.27	
E	10.00		10.40
e	2.40		2.70
e1	4.95		5.15
F	1.23		1.32
H1	6.20		6.60
J1	2.40		2.72
L	13.00		14.00
L1	3.50		3.93
L20		16.40	
L30		28.90	
øP	3.75		3.85
Q	2.65		2.95
Slug flatness		0.03	0.10

4.4 Packing information

Figure 28. Tape outline



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Figure 29. Reel outline

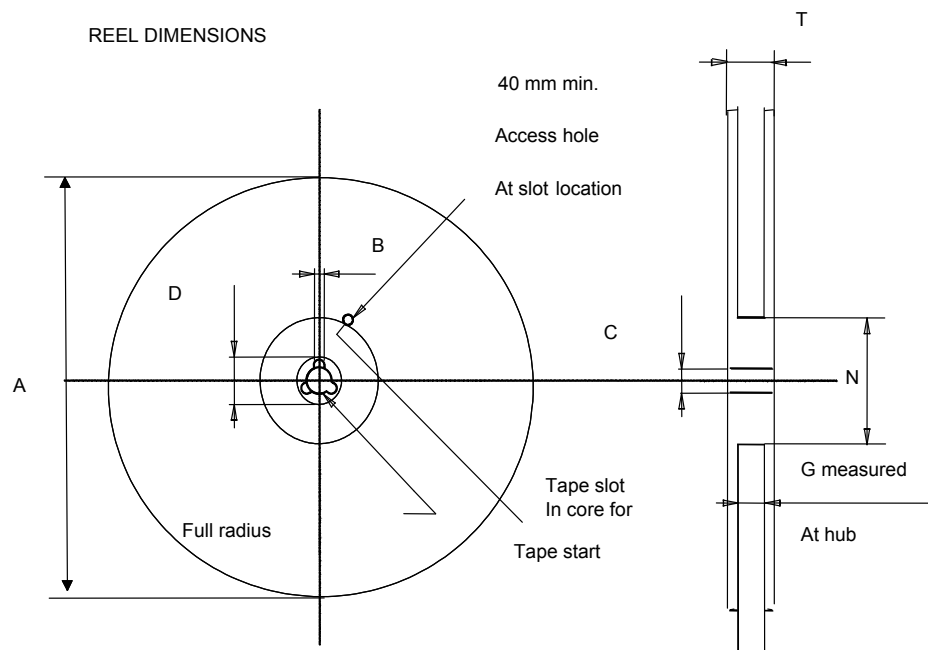


Table 10. Tape and reel mechanical data

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			

5 Ordering information

Table 11. Order codes

Order codes	Marking	Package	Packing
STH270N8F7-2	270N8F7	H ² PAK-2	Tape and reel
STH270N8F7-6		H ² PAK-6	
STP270N8F7		TO-220	Tube

Revision history

Table 12. Document revision history

Date	Version	Changes
03-Dec-2012	1	First release.
09-Apr-2013	2	<ul style="list-style-type: none"> – Modified: $R_{DS(on)}$ max values on <i>Features</i> table, I_{DSS}, I_{GSS} values on <i>Table 4</i>, $R_{DS(on)}$ value for H²PAK-2, the entire typical values on <i>Table 5</i> and <i>6</i>, V_{SD} test conditions and max values, T_{RR}, Q_{RR}, I_{RRM} typical values on <i>Table 7</i> – Inserted: <i>Section 3: Electrical characteristics (curves)</i> – Document status promoted to preliminary data to production data – Added: H²PAK-6 package – Minor text changes
11-Oct-2013	3	<ul style="list-style-type: none"> – Modified: C_{rSS} typical value in <i>Table 5</i> – Updated: <i>Section 5: Package information</i> – Updated: <i>Figure 18, 19, 20</i> and <i>21</i> – Minor text changes
14-May-2015	4	<ul style="list-style-type: none"> – Updated title, features and description in cover page. – Minor text changes
12-Mar-2021	5	<ul style="list-style-type: none"> Modified Table 3. On/off states. Minor text changes.

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