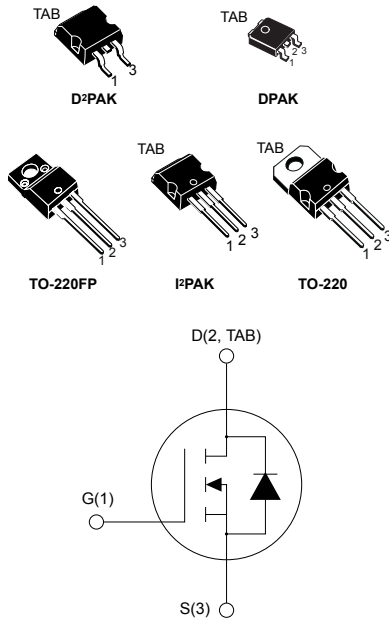


N-channel 100 V, 6.8 mΩ typ., 80 A STripFET F7 Power MOSFETs
in D²PAK, DPAK, TO-220FP, I²PAK and TO-220 packages



AM01475v1_noZen



Features

Order codes	V _{DS}	R _{DS(on)} max.	I _D	Package
STB100N10F7	100 V	8.0 mΩ	80 A	D ² PAK
STD100N10F7			80 A	DPAK
STF100N10F7			45 A	TO-220FP
STI100N10F7			80 A	I ² PAK
STP100N10F7			80 A	TO-220

- Among the lowest R_{DS(on)} on the market
- Excellent FoM (figure of merit)
- Low C_{rss}/C_{iss} ratio for EMI immunity
- High avalanche ruggedness

Applications

- Switching applications

Description

These N-channel Power MOSFETs utilize STripFET F7 technology with an enhanced trench gate structure that results in very low on-state resistance, while also reducing internal capacitance and gate charge for faster and more efficient switching.

Product status links

[STB100N10F7](#)
[STD100N10F7](#)
[STF100N10F7](#)
[STI100N10F7](#)
[STP100N10F7](#)

1 Electrical ratings

Table 1. Absolute maximum ratings

Symbol	Parameter	Value			Unit
		DPAK	TO-220FP	D ² PAK I ² PAK TO-220	
V _{DS}	Drain-source voltage	100			V
V _{GS}	Gate-source voltage	±20			V
I _D	Drain current (continuous) at T _C = 25 °C	80	45 ⁽¹⁾	80	A
	Drain current (continuous) at T _C = 100 °C	62	32 ⁽¹⁾	70	A
I _{DM} ⁽²⁾	Drain current (pulsed)	320	180	320	A
P _{TOT} ⁽¹⁾	Total power dissipation at T _C = 25 °C	120	30	150	W
V _{ISO}	Insulation withstand voltage (RMS) from all three leads to external heatsink (t = 1 s, T _C = 25 °C)	2.5			kV
T _J	Operating junction temperature	-55 to 175			°C
T _{stg}	Storage temperature range				°C

1. This value is limited by package.
2. Pulse width is limited by safe operating area.

Table 2. Thermal resistance

Symbol	Parameter	Value				Unit
		D ² PAK	DPAK	TO-220FP	I ² PAK TO-220	
R _{thJC}	Thermal resistance, junction-to-case	1	1.25	5	1	°C/W
R _{thJA}	Thermal resistance, junction-to-ambient	62.5				°C/W
R _{thJB} ⁽¹⁾	Thermal resistance, junction-to-board	30	50			°C/W

1. When mounted on an 1-inch² FR-4 board, 2oz CU, t < 10 s.

Table 3. Avalanche characteristics

Symbol	Parameter	Value	Unit
E _{AS}	Single pulse avalanche energy (T _J = 25 °C, L = 3.5 mH, I _{AS} = 15 A, V _{DD} = 50 V, V _{GS} = 10 V)	400	mJ

2 Electrical characteristics

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

Table 4. On-/off-states

Symbol	Parameter	Test conditions		Min.	Typ.	Max.	Unit
		D ² PAK, DPAK I ² PAK, TO-220	TO-220FP				
$V_{(BR)DSS}$	Drain-source breakdown voltage	$I_D = 250\ \mu\text{A}, V_{GS} = 0\ \text{V}$		100			V
I_{DSS}	Zero gate voltage drain current	$V_{DS} = 100\ \text{V}, V_{GS} = 0\ \text{V}$				1	μA
		$V_{DS} = 100\ \text{V}, V_{GS} = 0\ \text{V}, T_C = 125\text{ °C}^{(1)}$				100	μA
I_{GSS}	Gate-body leakage current	$V_{GS} = 20\ \text{V}, V_{DS} = 0\ \text{V}$				100	nA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}, I_D = 250\ \mu\text{A}$		2.5		4.5	V
$R_{DS(on)}$	Static drain-source on-resistance	$V_{GS} = 10\ \text{V}, I_D = 40\ \text{A}$	$V_{GS} = 10\ \text{V}, I_D = 22.5\ \text{A}$		6.8	8.0	m Ω

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

Table 5. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	$V_{DS} = 50\ \text{V}, f = 1\ \text{MHz}, V_{GS} = 0\ \text{V}$	-	4369	-	pF
C_{oss}	Output capacitance		-	823	-	pF
C_{riss}	Reverse transfer capacitance		-	36	-	pF
Q_g	Total gate charge	$V_{DD} = 50\ \text{V}, I_D = 80\ \text{A},$	-	61	-	nC
Q_{gs}	Gate-source charge	$V_{GS} = 0\ \text{to}\ 10\ \text{V}$	-	26	-	nC
Q_{gd}	Gate-drain charge	(see Figure 17. Test circuit for gate charge behavior)	-	13	-	nC

Table 6. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{DD} = 50\ \text{V}, I_D = 40\ \text{A},$	-	27	-	ns
t_r	Rise time	$R_G = 4.7\ \Omega, V_{GS} = 10\ \text{V}$	-	40	-	ns
$t_{d(off)}$	Turn-off delay time	(see Figure 16. Test circuit for resistive load switching times and Figure 21. Switching time waveform)	-	46	-	ns
t_f	Fall time		-	15	-	ns

Table 7. Source-drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain current		-		80	A
$I_{SDM}^{(1)}$	Source-drain current (pulsed)		-		320	A
$V_{SD}^{(2)}$	Forward on voltage	$I_{SD} = 80 \text{ A}, V_{GS} = 0 \text{ V}$	-		1.2	V
t_{rr}	Reverse recovery time	$I_{SD} = 80 \text{ A}, di/dt = 100 \text{ A}/\mu\text{s}$	-	77		ns
Q_{rr}	Reverse recovery charge	$V_{DD} = 80 \text{ V}, T_J = 150 \text{ }^\circ\text{C}$	-	146		nC
I_{RRM}	Reverse recovery current	(see Figure 18. Test circuit for inductive load switching and diode recovery times)	-	4		A

1. Pulse width is limited by safe operating area.
2. Pulsed: pulse duration = 300 μs , duty cycle 1.5%

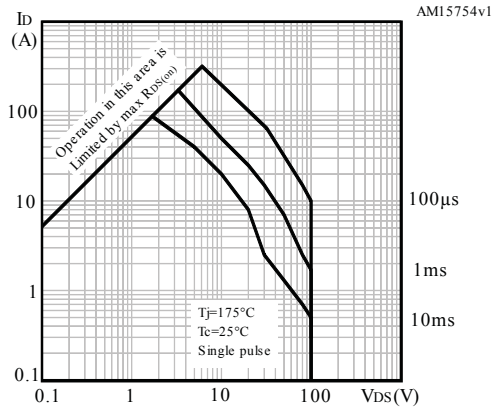
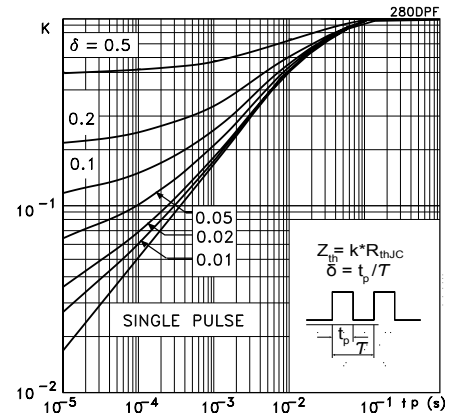
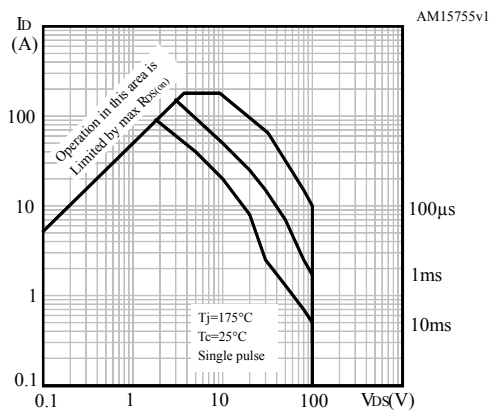
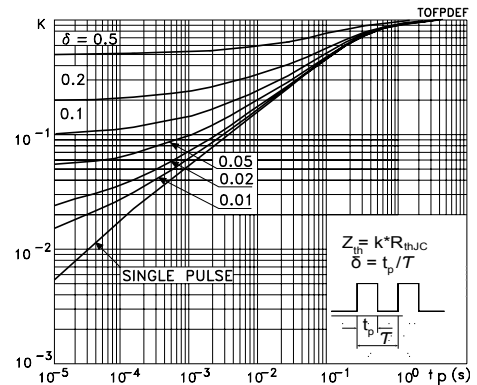
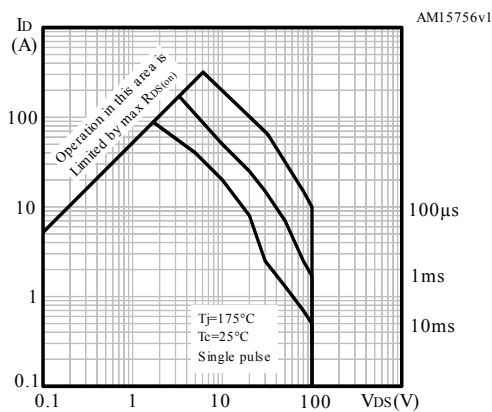
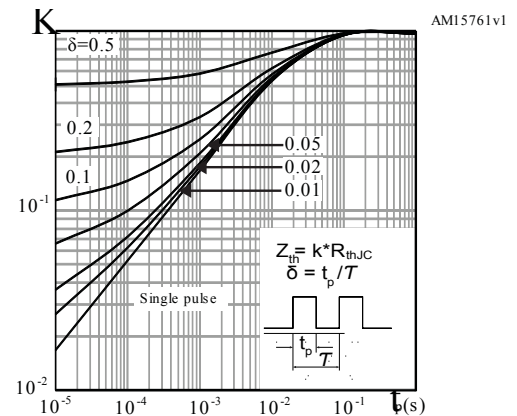
2.1 Electrical characteristics (curves)
Figure 1. Safe operating area for DPAK

Figure 2. Thermal impedance for DPAK

Figure 3. Safe operating area for TO-220FP

Figure 4. Thermal impedance for TO-220FP

Figure 5. Safe operating area for D²PAK, I²PAK and TO-220

Figure 6. Thermal impedance for D²PAK, I²PAK and TO-220


Figure 7. Output characteristics

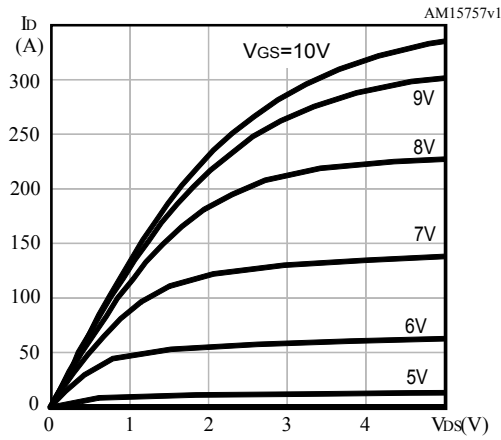


Figure 8. Transfer characteristics

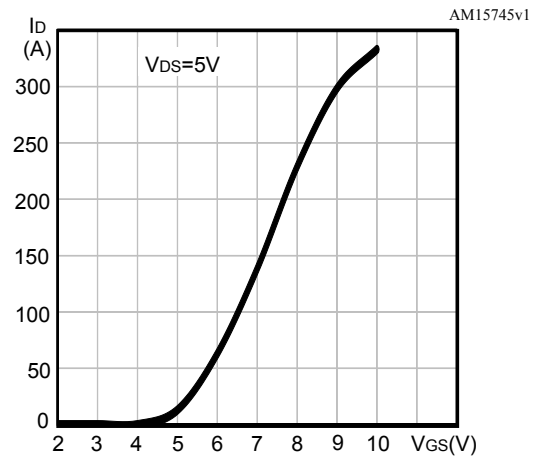


Figure 9. Normalized $V_{(BR)DSS}$ vs temperature

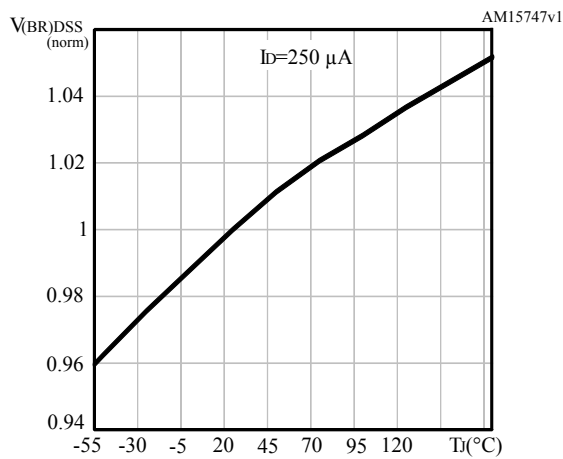


Figure 10. Static drain-source on-resistance

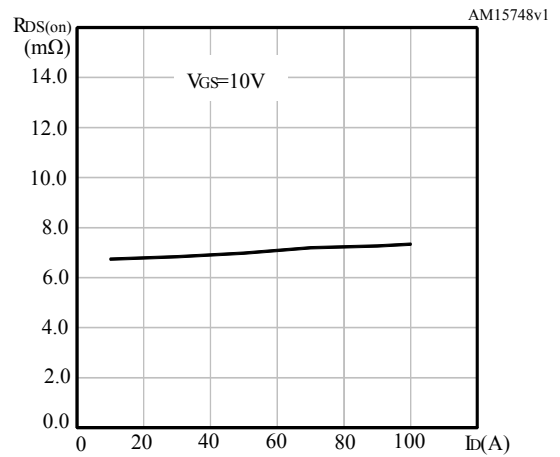


Figure 11. Gate charge vs gate-source voltage

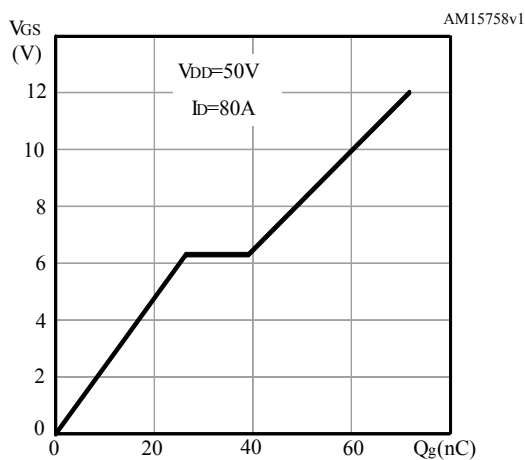


Figure 12. Capacitance variations

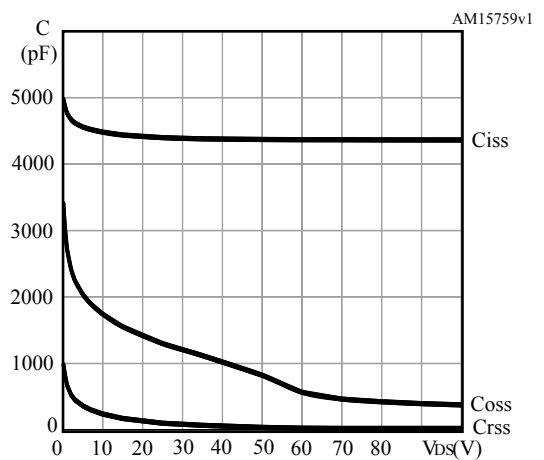


Figure 13. Normalized gate threshold voltage vs temperature

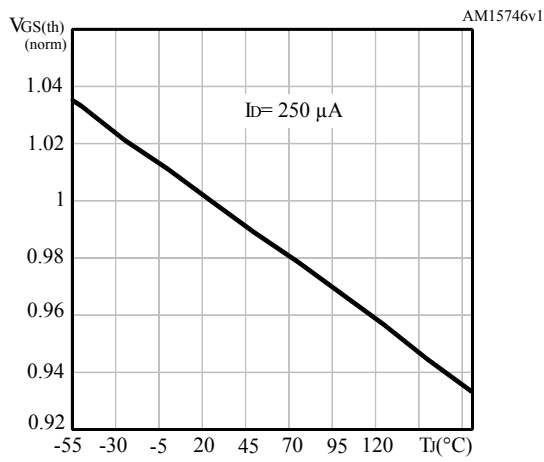


Figure 14. Normalized on-resistance vs temperature

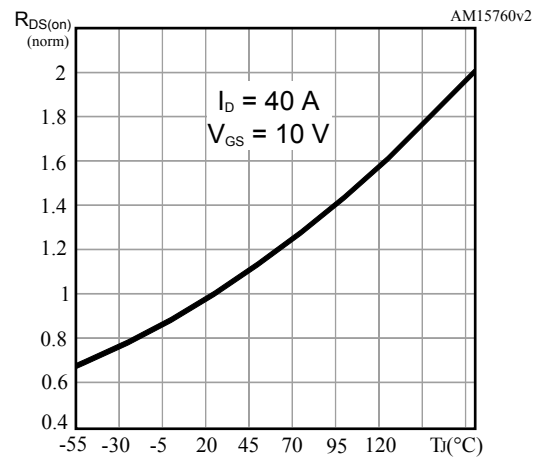
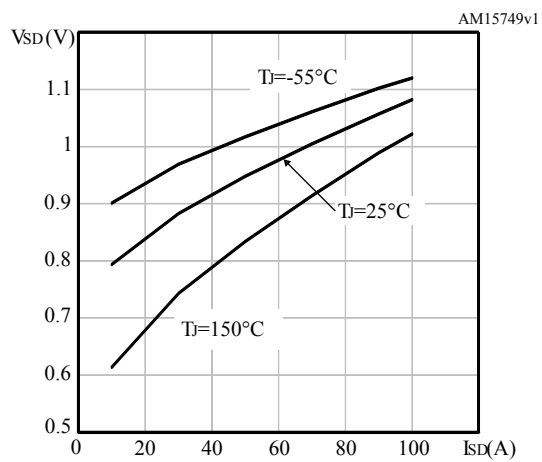
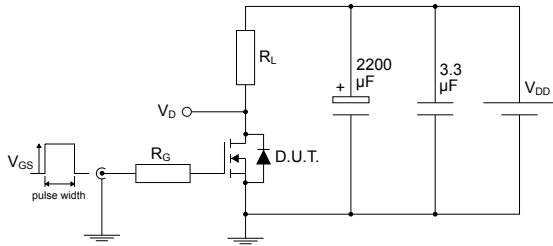


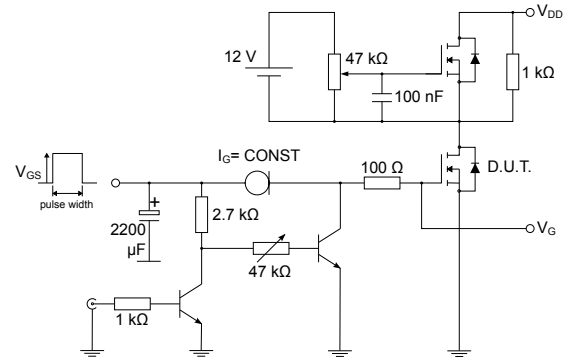
Figure 15. Source-drain diode forward characteristics



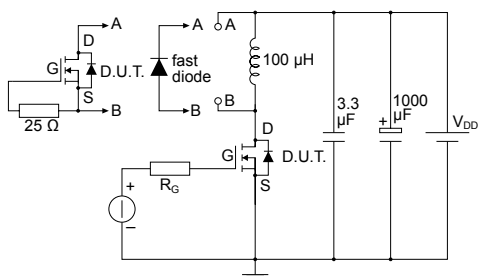
3 Test circuits

Figure 16. Test circuit for resistive load switching times


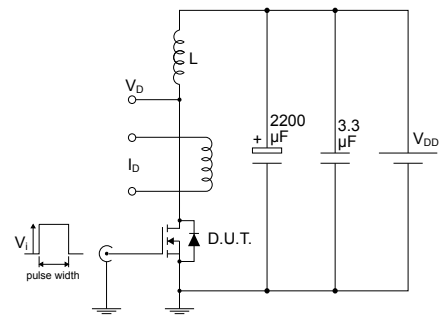
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Figure 17. Test circuit for gate charge behavior


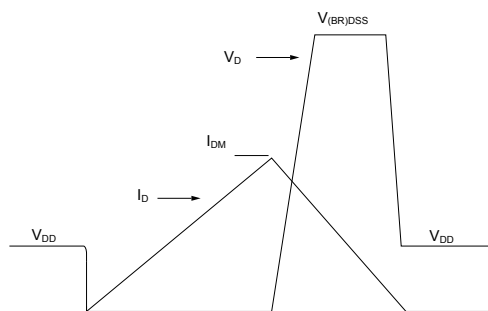
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Figure 18. Test circuit for inductive load switching and diode recovery times


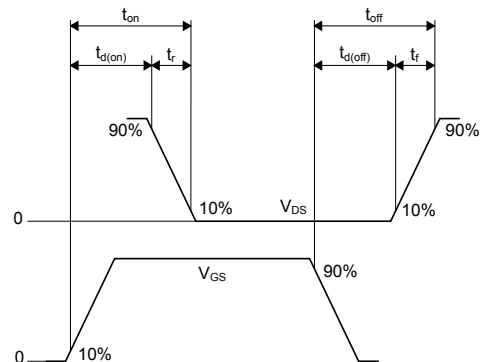
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Figure 19. Unclamped inductive load test circuit


AM01471v1

Figure 20. Unclamped inductive waveform


AM01472v1

Figure 21. Switching time waveform


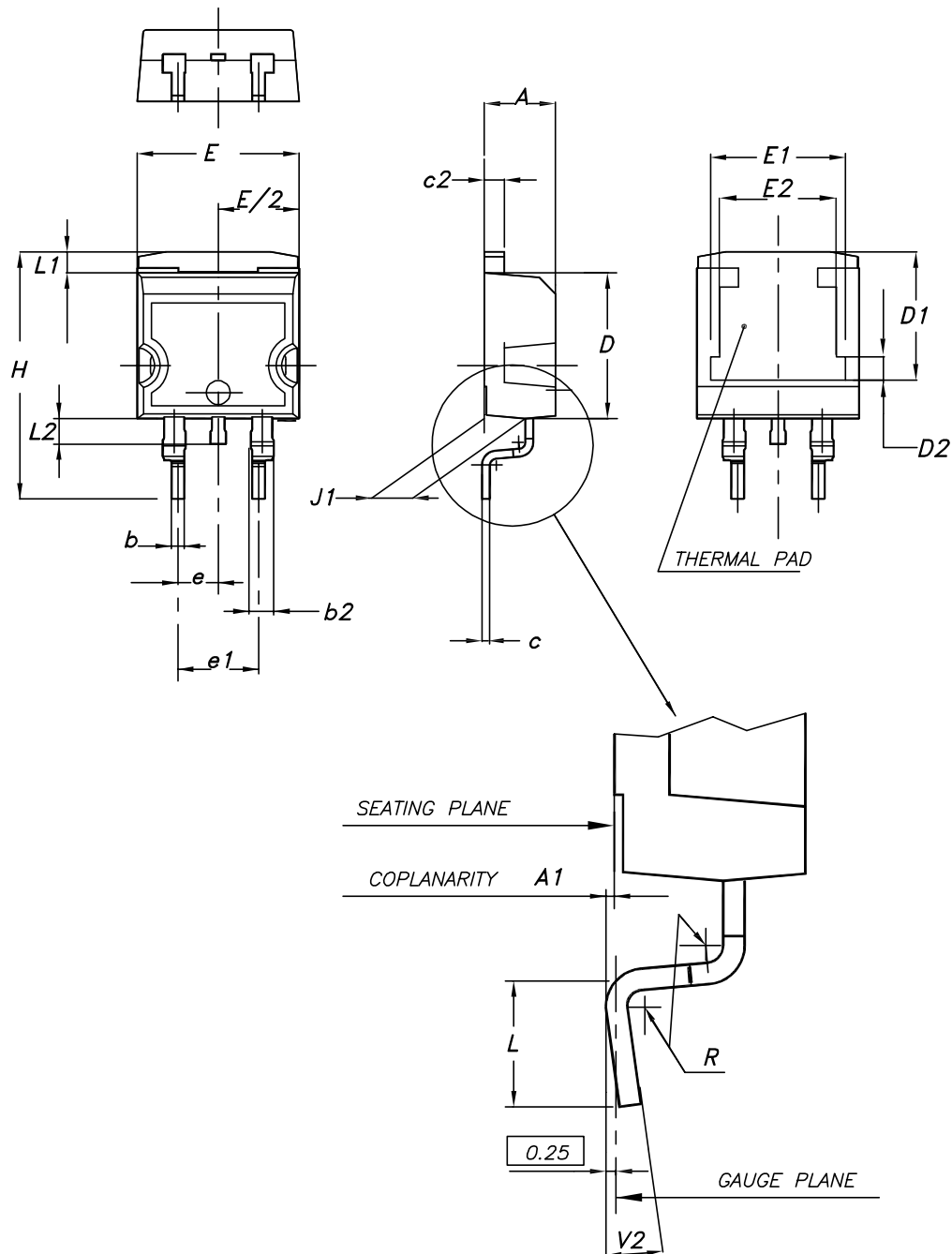
AM01473v1

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 D²PAK (TO-263) type A package information

Figure 22. D²PAK (TO-263) type A package outline

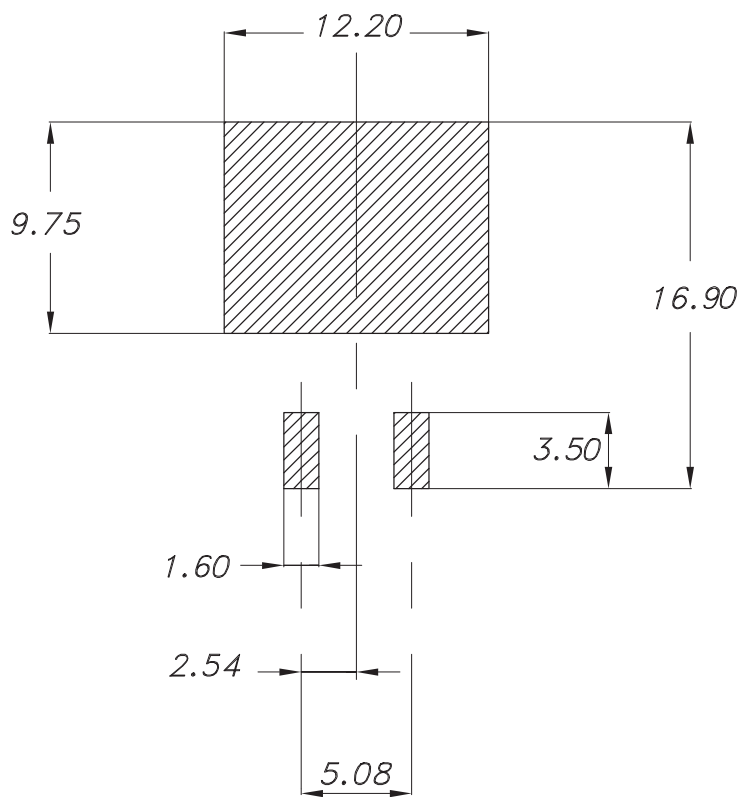


0079457_26

Table 8. D²PAK (TO-263) type A package mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	4.40		4.60
A1	0.03		0.23
b	0.70		0.93
b2	1.14		1.70
c	0.45		0.60
c2	1.23		1.36
D	8.95		9.35
D1	7.50	7.75	8.00
D2	1.10	1.30	1.50
E	10.00		10.40
E1	8.30	8.50	8.70
E2	6.85	7.05	7.25
e		2.54	
e1	4.88		5.28
H	15.00		15.85
J1	2.49		2.69
L	2.29		2.79
L1	1.27		1.40
L2	1.30		1.75
R		0.40	
V2	0°		8°

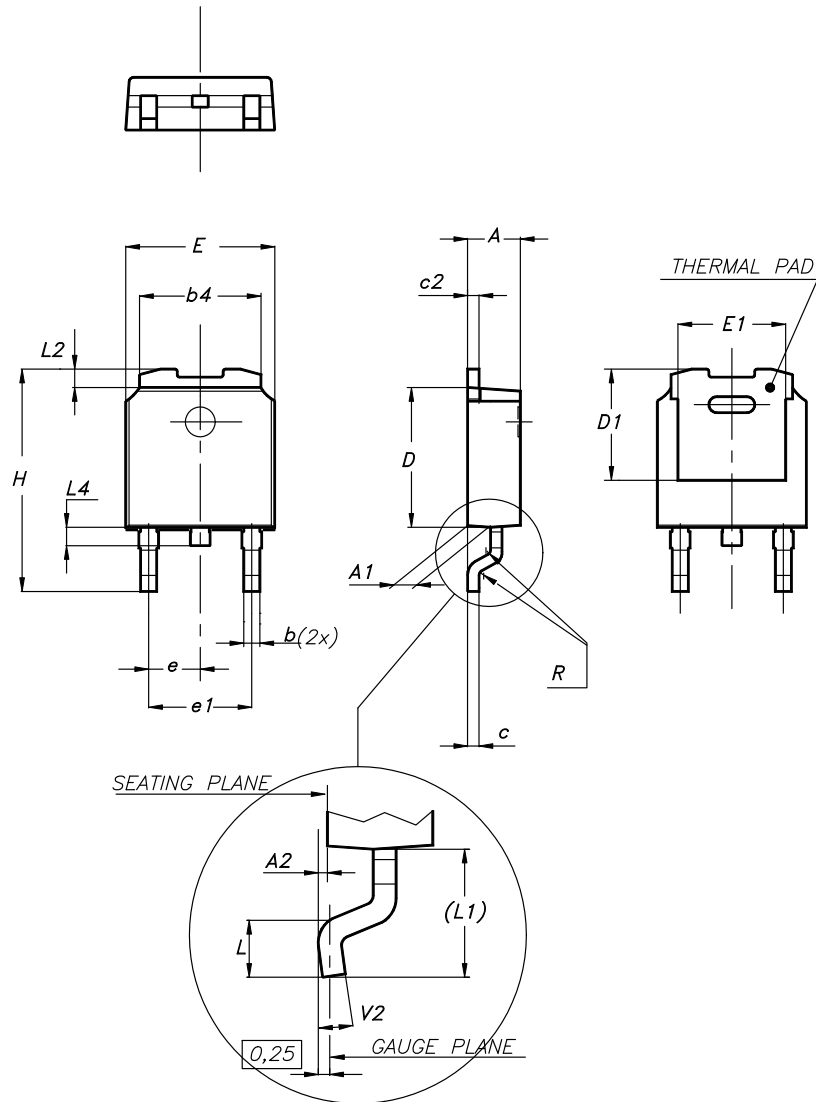
Figure 23. D²PAK (TO-263) recommended footprint (dimensions are in mm)



0079457_Rev26_footprint

4.2 DPAK (TO-252) type A2 package information

Figure 24. DPAK (TO-252) type A2 package outline

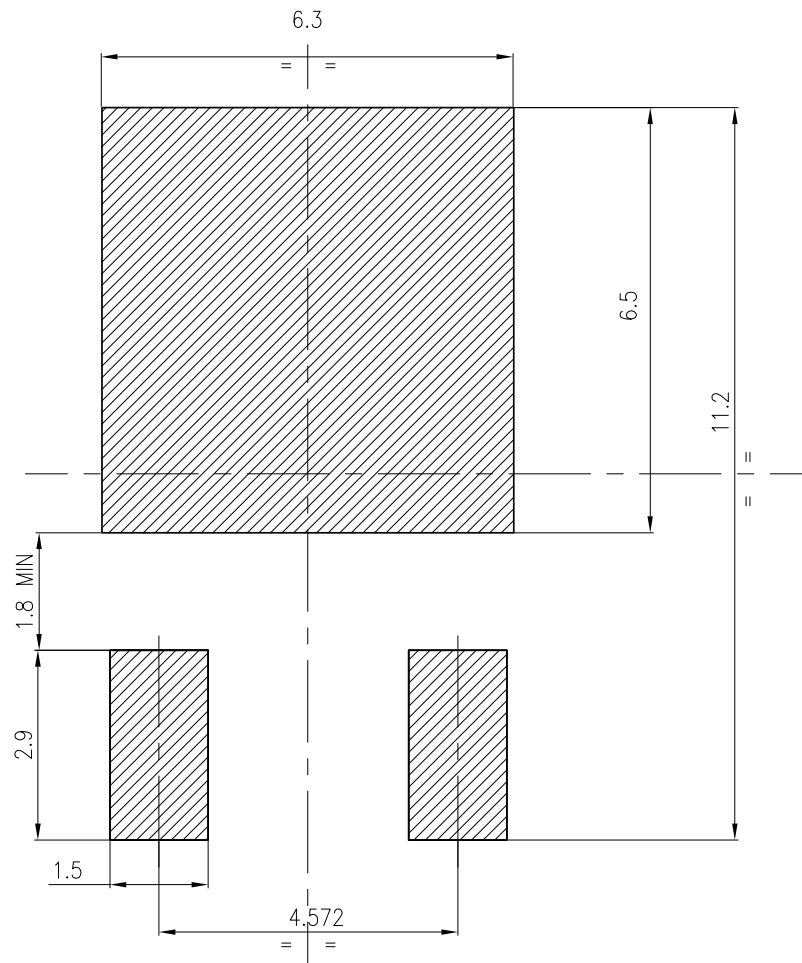


0068772_type-A2_rev30

**Table 9. DPAK (TO-252) type A2 mechanical data**

Dim.	mm		
	Min.	Typ.	Max.
A	2.20		2.40
A1	0.90		1.10
A2	0.03		0.23
b	0.64		0.90
b4	5.20		5.40
c	0.45		0.60
c2	0.48		0.60
D	6.00		6.20
D1	4.95	5.10	5.25
E	6.40		6.60
E1	5.10	5.20	5.30
e	2.159	2.286	2.413
e1	4.445	4.572	4.699
H	9.35		10.10
L	1.00		1.50
L1	2.60	2.80	3.00
L2	0.65	0.80	0.95
L4	0.60		1.00
R		0.20	
V2	0°		8°

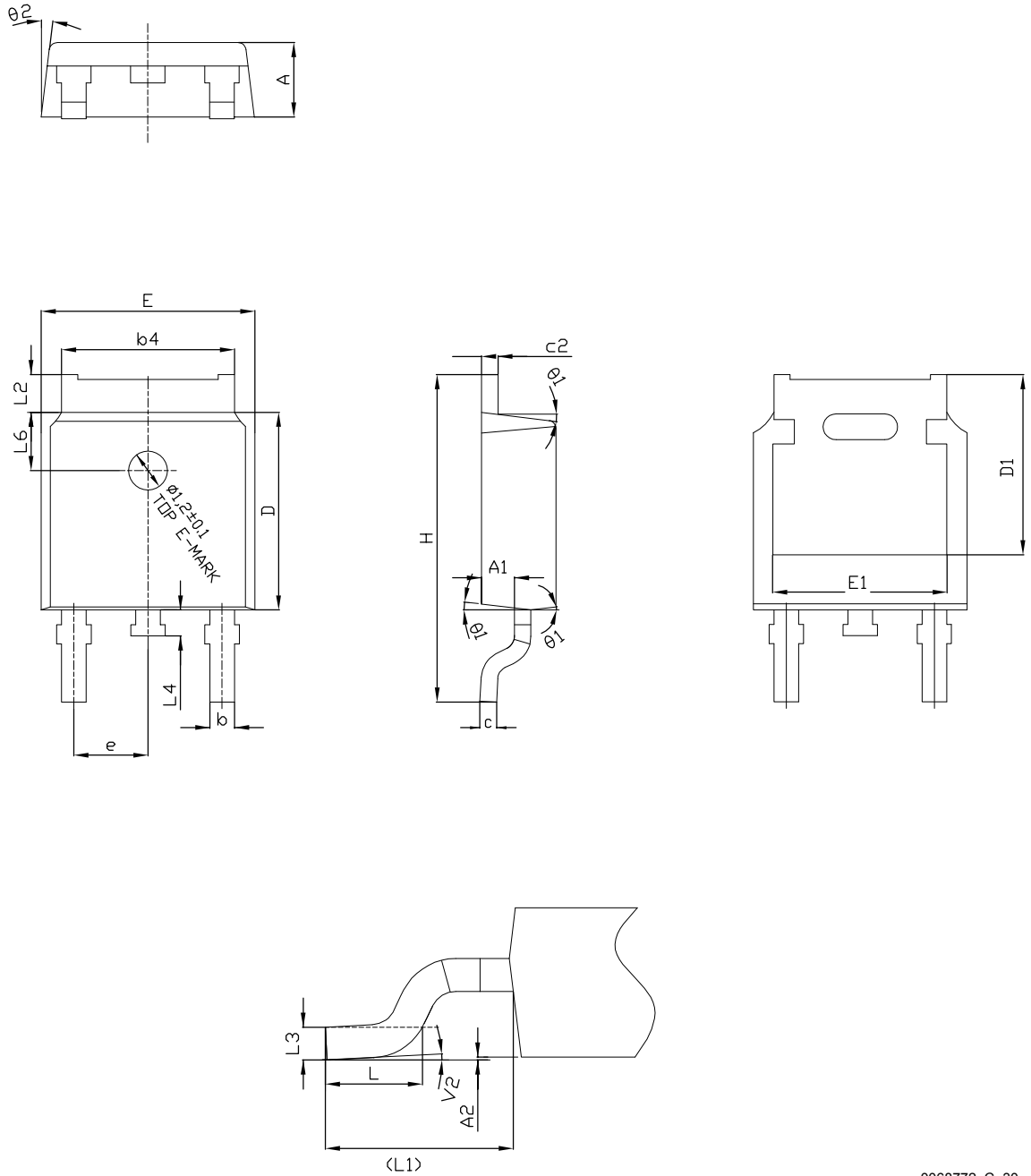
Figure 25. DPAK (TO-252) recommended footprint (dimensions are in mm)



FP_0068772_30

4.3 DPAK (TO-252) type C package information

Figure 26. DPAK (TO-252) type C package outline

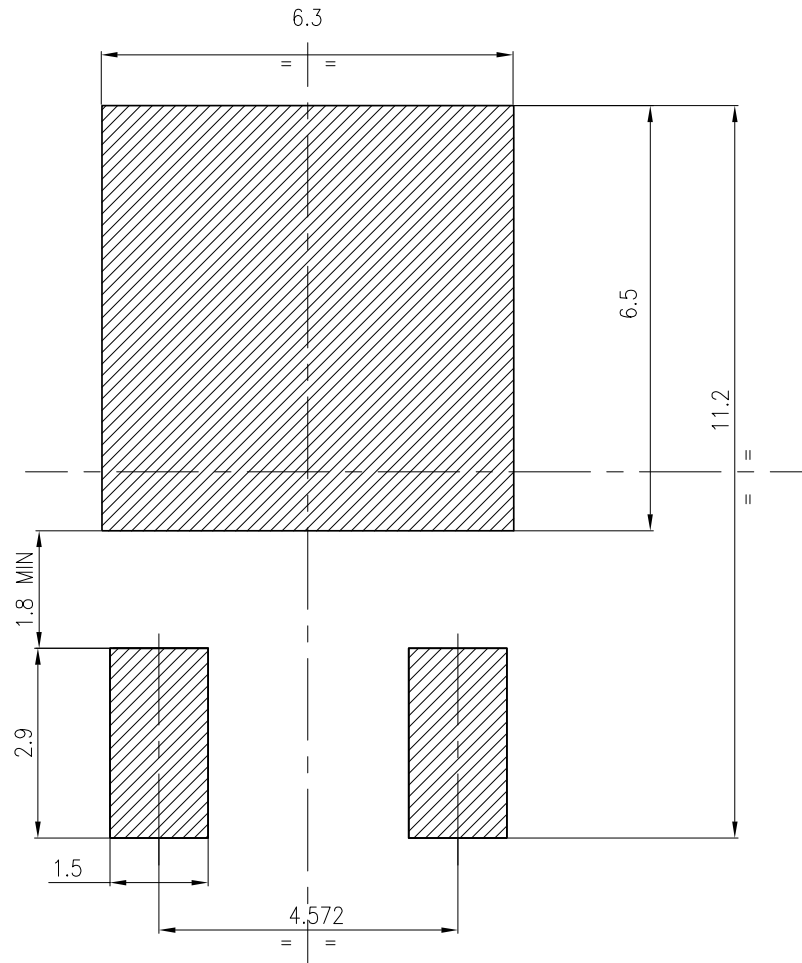


0068772_C_30

**Table 10. DPAK (TO-252) type C mechanical data**

Dim.	mm		
	Min.	Typ.	Max.
A	2.20	2.30	2.38
A1	0.90	1.01	1.10
A2	0.00		0.10
b	0.72		0.85
b4	5.13	5.33	5.46
c	0.47		0.60
c2	0.47		0.60
D	6.00	6.10	6.20
D1	5.25		
E	6.50	6.60	6.70
E1	4.70		
e	2.186	2.286	2.386
H	9.80	10.10	10.40
L	1.40	1.50	1.70
L1	2.90 REF		
L2	0.90		1.25
L3	0.51 BSC		
L4	0.60	0.80	1.00
L6	1.80 BSC		
θ1	5°	7°	9°
θ2	5°	7°	9°
V2	0°		8°

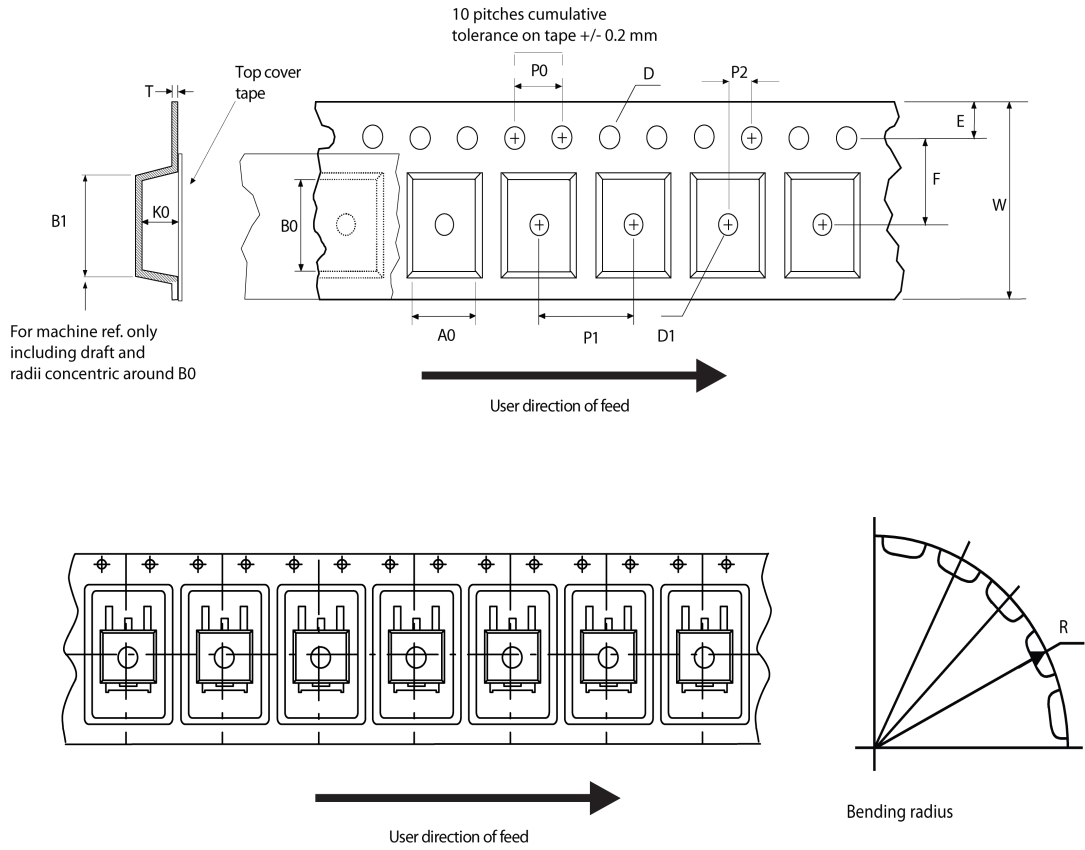
Figure 27. DPAK (TO-252) recommended footprint (dimensions are in mm)



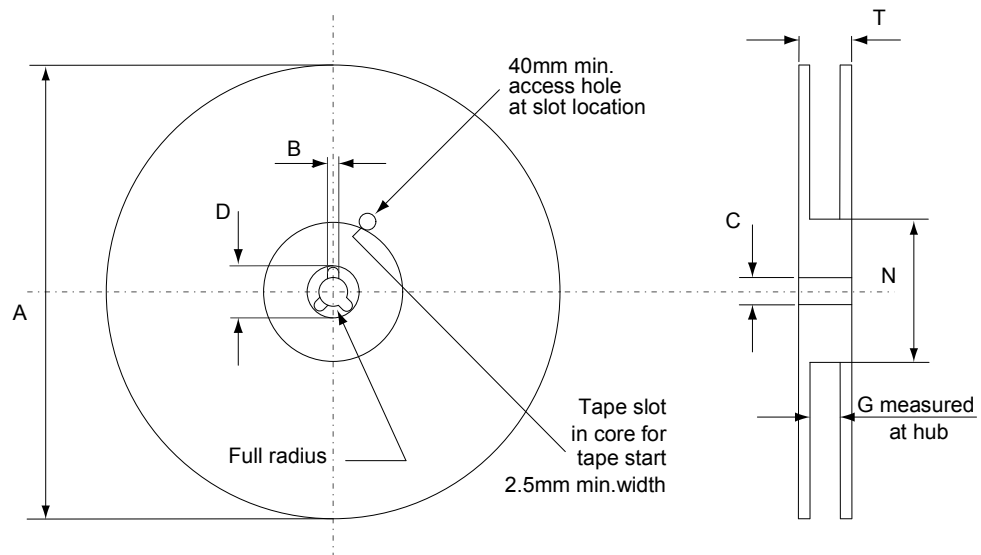
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4.4 D²PAK and DPAK packing information

Figure 28. Tape outline



AM08852v1

Figure 29. Reel outline


AM06038v1

Table 11. D²PAK 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			

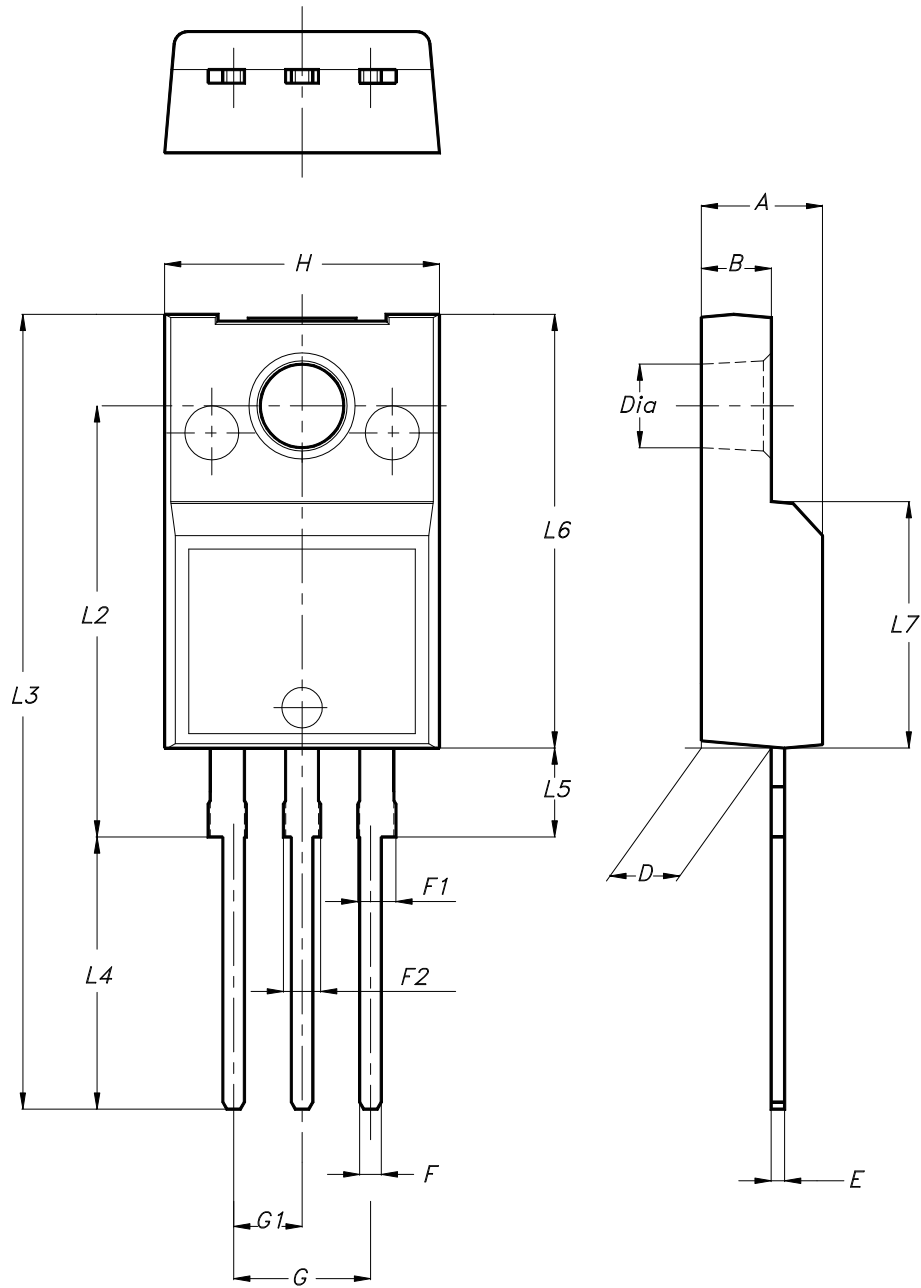


Table 12. DPAK tape and reel mechanical data

Tape			Reel		
Dim.	mm		Dim.	mm	
	Min.	Max.		Min.	Max.
A0	6.8	7	A		330
B0	10.4	10.6	B	1.5	
B1		12.1	C	12.8	13.2
D	1.5	1.6	D	20.2	
D1	1.5		G	16.4	18.4
E	1.65	1.85	N	50	
F	7.4	7.6	T		22.4
K0	2.55	2.75			
P0	3.9	4.1	Base qty.		2500
P1	7.9	8.1	Bulk qty.		2500
P2	1.9	2.1			
R	40				
T	0.25	0.35			
W	15.7	16.3			

4.5 TO-220FP package information

Figure 30. TO-220FP package outline



7012510_Rev_13_B

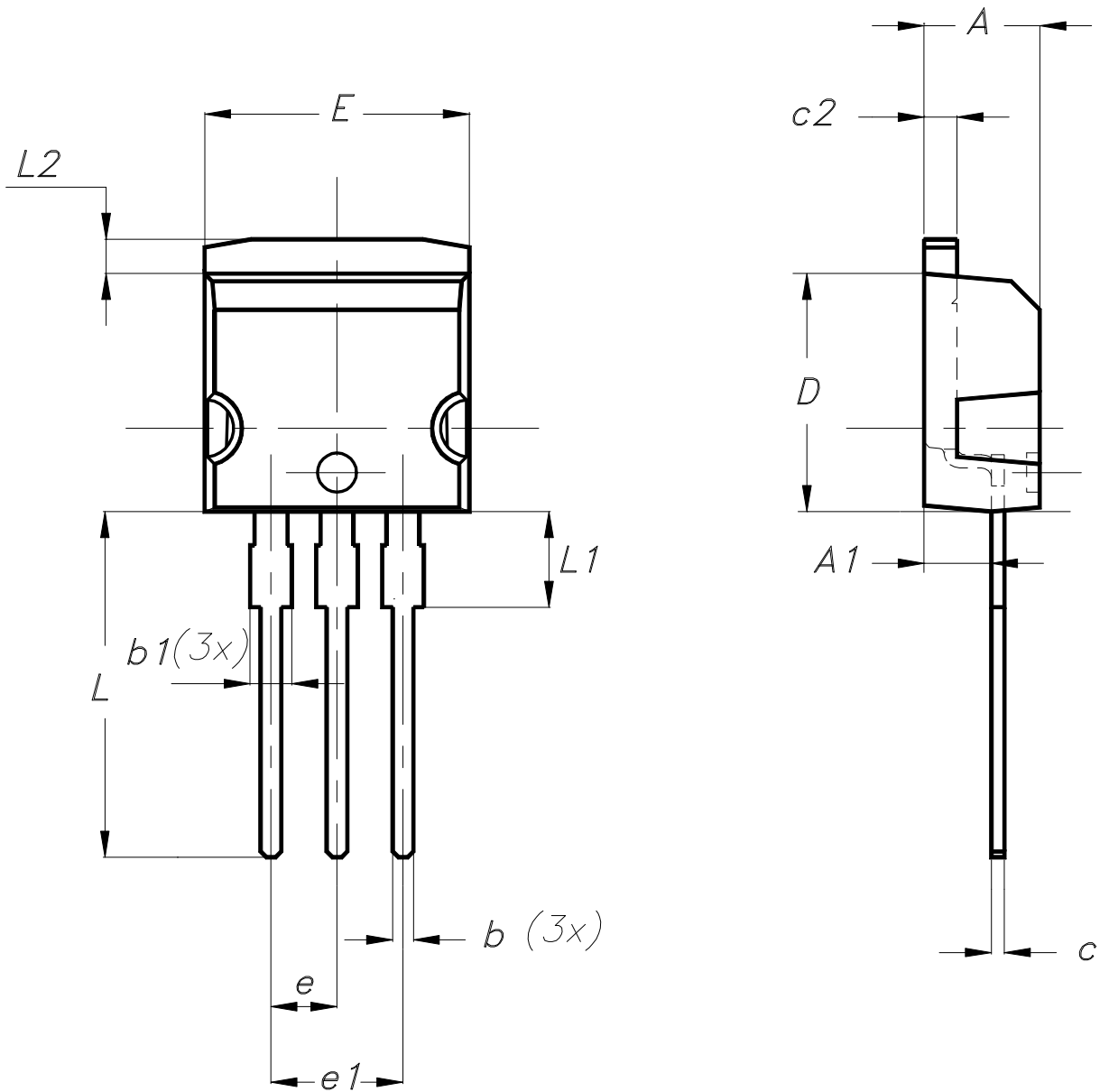


Table 13. TO-220FP package mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	4.40		4.60
B	2.50		2.70
D	2.50		2.75
E	0.45		0.70
F	0.75		1.00
F1	1.15		1.70
F2	1.15		1.70
G	4.95		5.20
G1	2.40		2.70
H	10.00		10.40
L2		16.00	
L3	28.60		30.60
L4	9.80		10.60
L5	2.90		3.60
L6	15.90		16.40
L7	9.00		9.30
Dia	3.00		3.20

4.6 I²PAK package information

Figure 31. I²PAK package outline



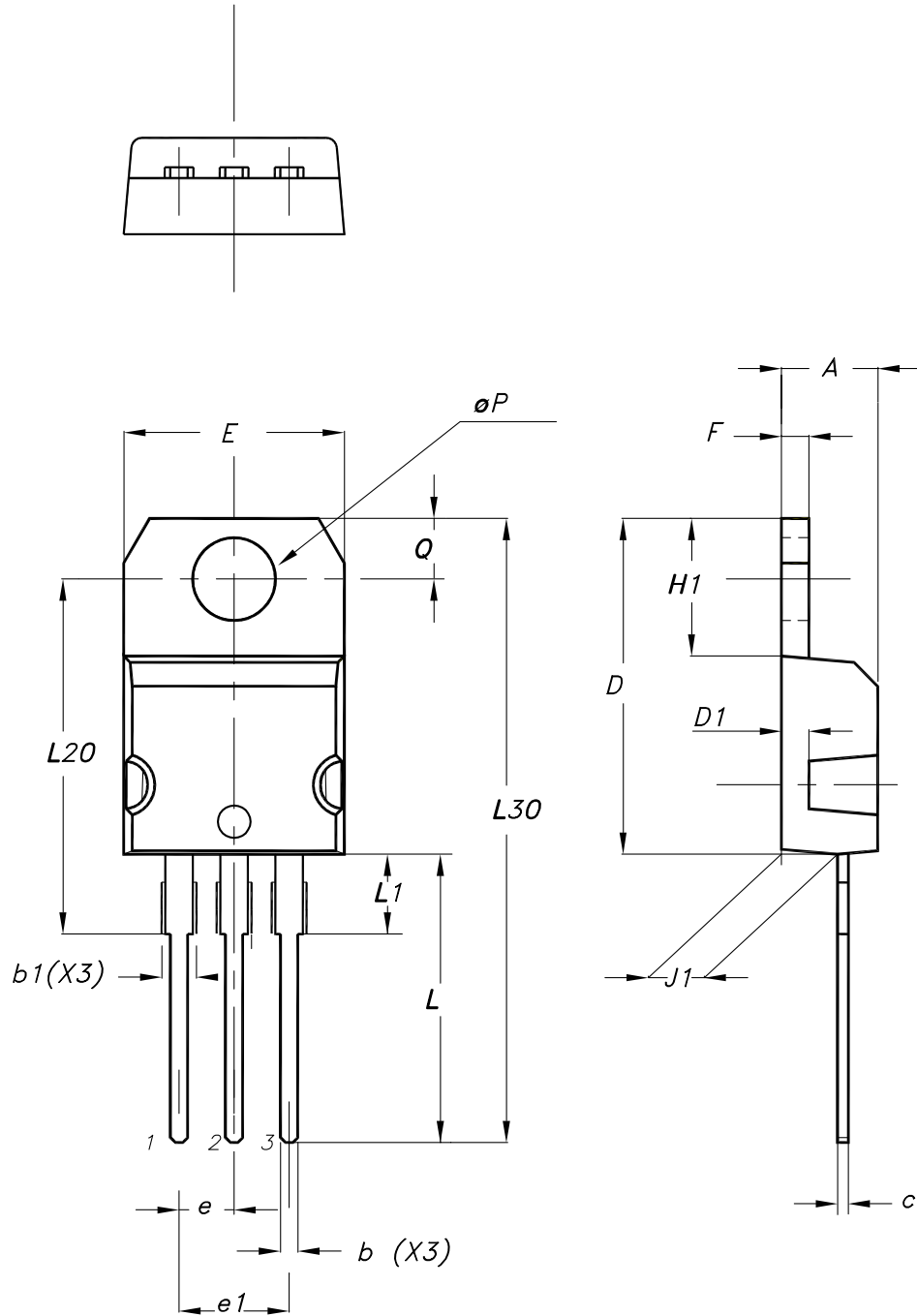
0004982_Rev_9

Table 14. I²PAK package mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	4.40	-	4.60
A1	2.40	-	2.72
b	0.61	-	0.88
b1	1.14	-	1.70
c	0.49	-	0.70
c2	1.23	-	1.32
D	8.95	-	9.35
e	2.40	-	2.70
e1	4.95	-	5.15
E	10.00	-	10.40
L	13.00	-	14.00
L1	3.50	-	3.93
L2	1.27	-	1.40

4.7 TO-220 type A package information

Figure 32. TO-220 type A package outline



0015988_typeA_Rev_23

Table 15. 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



5 Ordering information

Table 16. Order codes

Order code	Marking	Package	Packing
STB100N10F7	100N10F7	D ² PAK	Tape and reel
STD100N10F7		DPAK	Tape and reel
STF100N10F7		TO-220FP	Tube
STI100N10F7		I ² PAK	Tube
STP100N10F7		TO-220	Tube

Revision history

Table 17. Document revision history

Date	Version	Changes
05-Oct-2012	1	Initial release.
07-Feb-2013	2	<p>Inserted device in TO-220FP.</p> <p>Updated title and features on the cover page, <i>Table 1: Device summary</i>, <i>Table 2: Absolute maximum ratings</i>, <i>Table 3: Thermal resistance</i> and <i>Table 5: On/off states</i> accordingly.</p> <p>Updated <i>Table 6: Dynamic</i>, <i>Table 7: Switching times</i>, <i>Table 8: Source drain diode</i> and <i>Section 4: Package mechanical data</i>.</p> <p>Added <i>Section 5: Packaging mechanical data</i>.</p>
29-Apr-2013	3	<p>Modified: the entire typical values in <i>Table 6</i>, <i>tf</i> typical value in <i>Table 7</i>, VSD and typical values for <i>trr</i>, <i>qrr</i>, IRRM</p> <p>Inserted: <i>Table 4: Avalanche characteristics</i> and <i>Section 2.1: Electrical characteristics (curves)</i></p> <p>Minor text changes</p>
25-Nov-2013	4	<p>Inserted device in D²PAK.</p> <p>Updated title and features on the cover page, <i>Table 1: Device summary</i>, <i>Table 2: Absolute maximum ratings</i>, <i>Table 3: Thermal resistance</i> and <i>Table 5: On/off states</i> accordingly.</p> <p>Updated <i>Table 6: Dynamic</i>, <i>Section 4: Package mechanical data</i> and <i>Section 5: Packaging mechanical data</i>.</p>
18-Jun-2018	5	<p>Added STI100N10F7 device and updated the document accordingly.</p> <p>Removed maturity status indication, updated title, features and description on cover page.</p> <p>Updated <i>Table 1. Absolute maximum ratings</i>.</p> <p>Updated <i>Section 4 Package information</i>.</p> <p>Minor text changes.</p>
02-Mar-2022	6	<p>Updated Section 4 Package information.</p> <p>Minor text changes.</p>



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