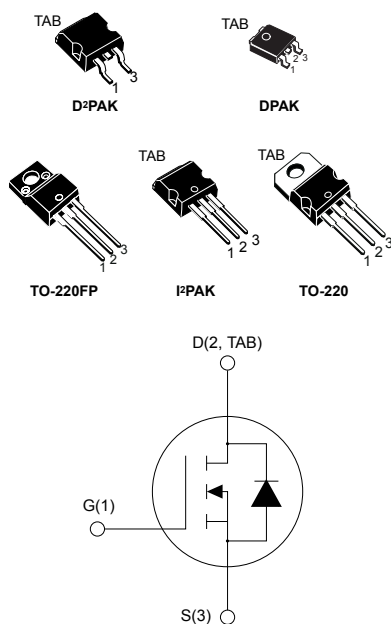


N-channel 100 V, 6.8 mΩ typ., 80 A STripFET F7 Power MOSFETs
in D²PAK, DPAK, TO-220FP, I²PAK and TO-220 packages



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

$T_{CASE} = 25\text{ }^{\circ}\text{C}$ 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	$I_D = 250\text{ }\mu\text{A}$, $V_{GS} = 0\text{ V}$		100			V
I_{DSS}	Zero gate voltage drain current	$V_{DS} = 100\text{ V}$, $V_{GS} = 0\text{ V}$				1	μA
		$V_{DS} = 100\text{ V}$, $V_{GS} = 0\text{ V}$, $T_C = 125\text{ }^{\circ}\text{C}^{(1)}$				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	$V_{DS} = V_{GS}$, $I_D = 250\text{ }\mu\text{A}$		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_{rss}	Reverse transfer capacitance		-	36	-	pF
Q_g	Total gate charge	$V_{DD} = 50\text{ V}$, $I_D = 80\text{ A}$, $V_{GS} = 0\text{ to }10\text{ V}$ (see Figure 17. Test circuit for gate charge behavior)	-	61	-	nC
Q_{gs}	Gate-source charge		-	26	-	nC
Q_{gd}	Gate-drain charge		-	13	-	nC

Table 6. Switching times

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

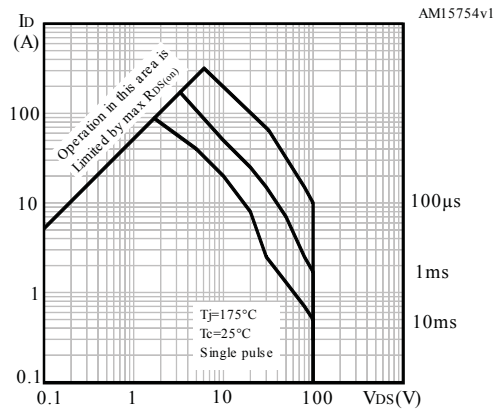
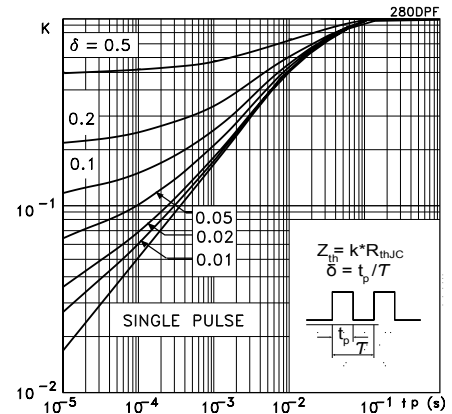
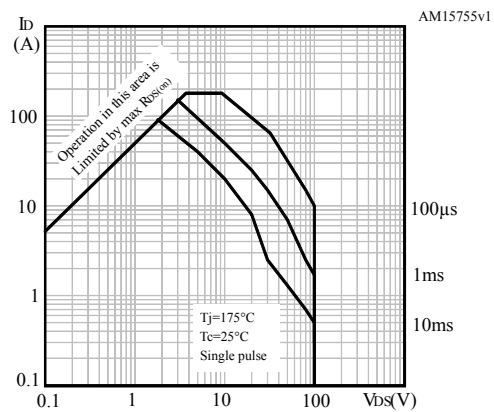
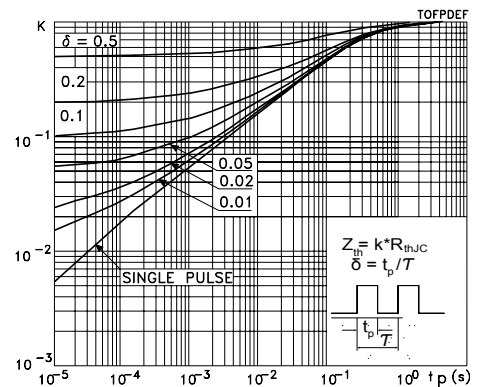
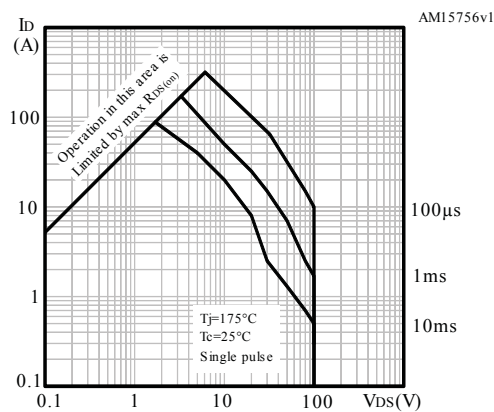
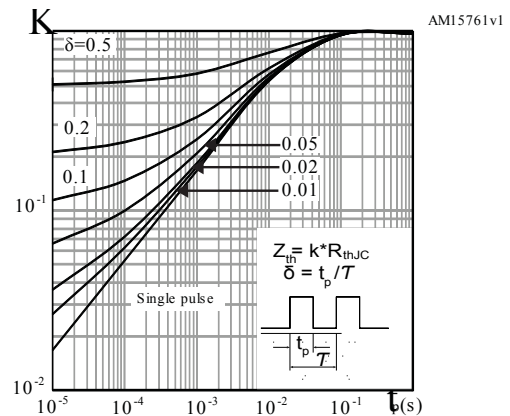
Figure 1. Safe operating area for DPAK

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


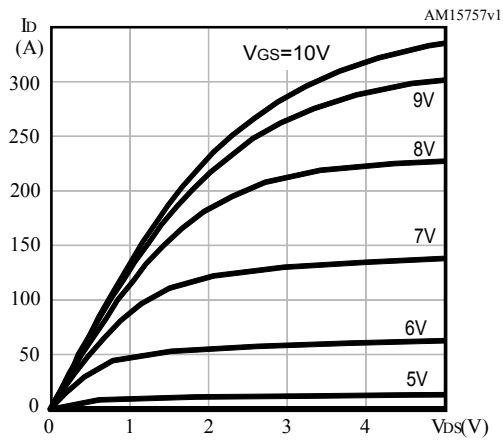
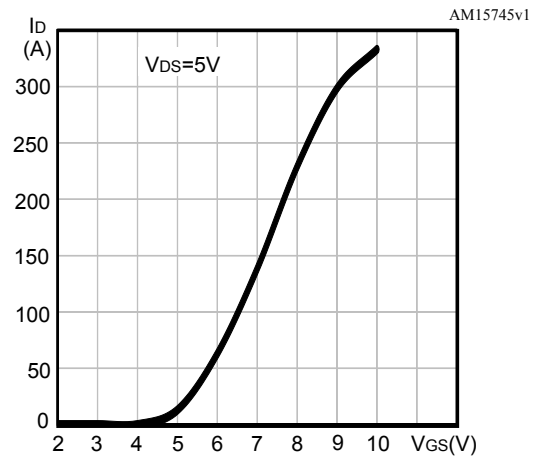
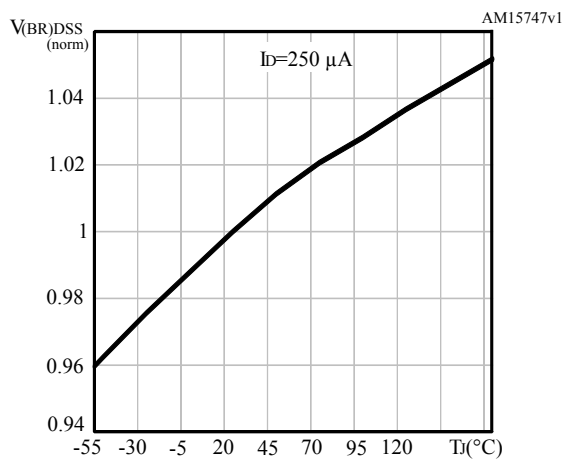
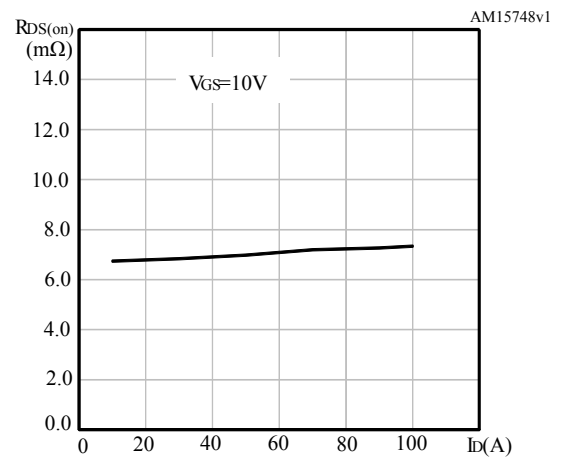
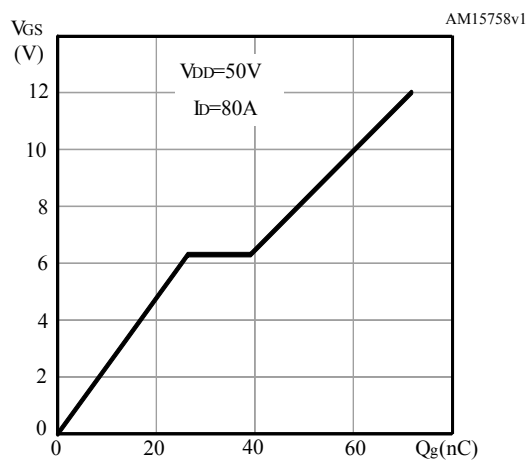
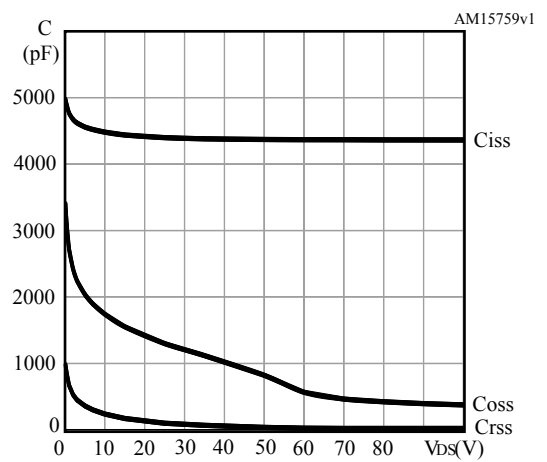
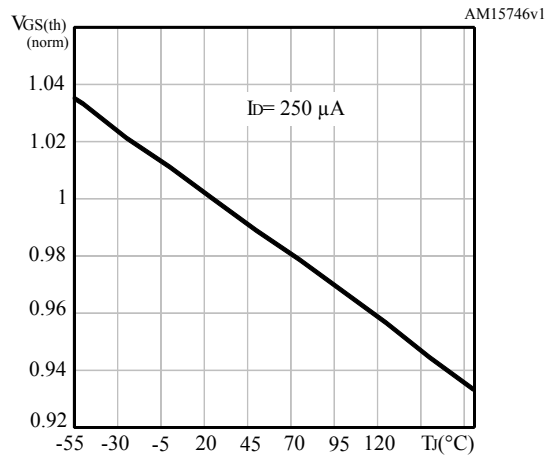
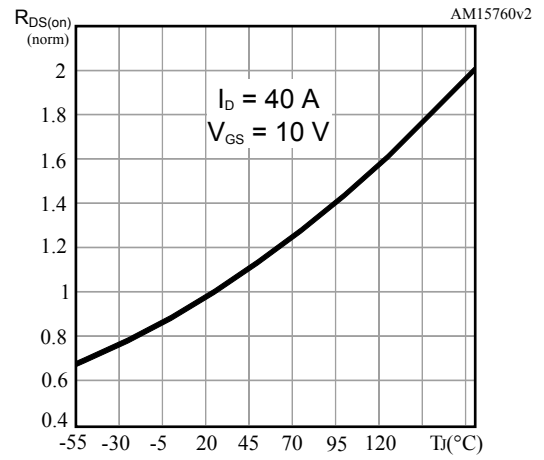
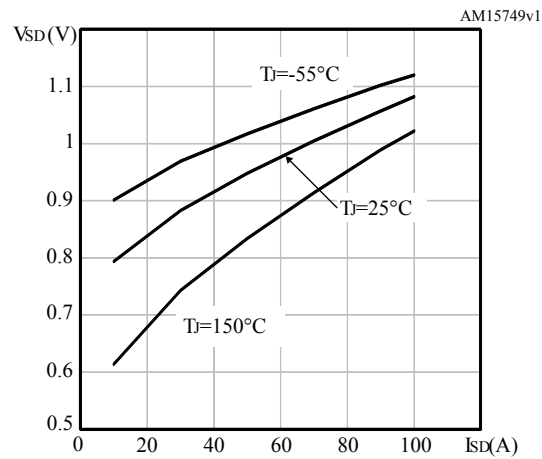
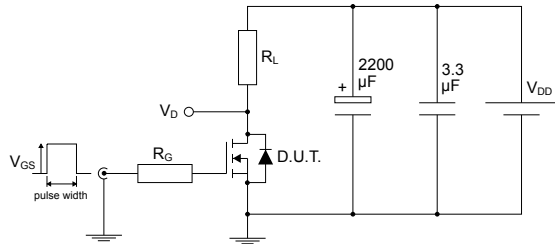
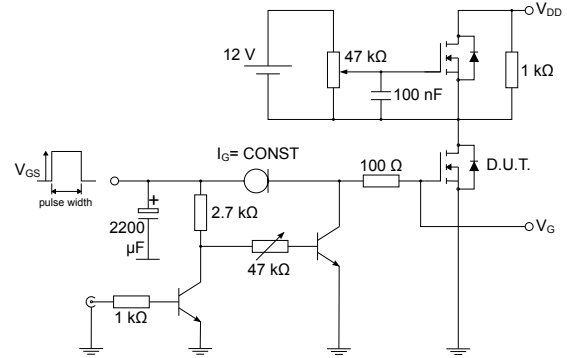
Figure 7. Output characteristics

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


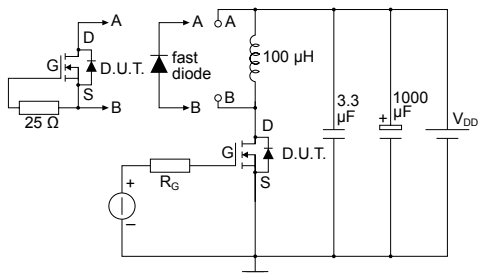
3 Test circuits

Figure 16. Test circuit for resistive load switching times


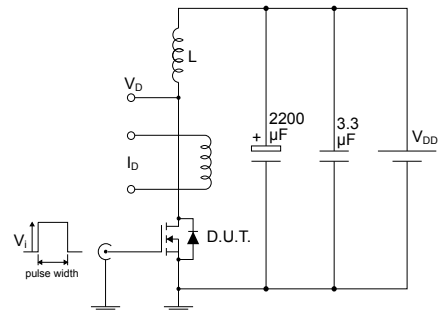
AM01468v1

Figure 17. Test circuit for gate charge behavior


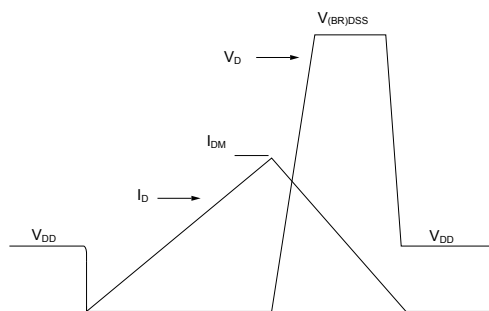
AM01469v1

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


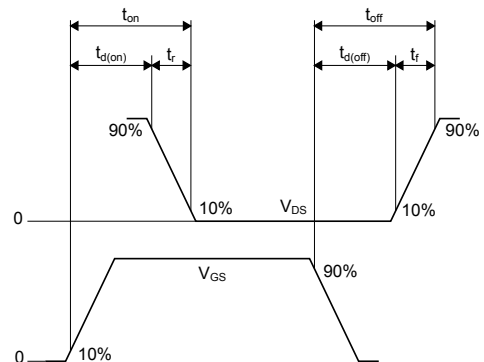
AM01470v1

Figure 19. Unclamped inductive load test circuit


AM01471v1

Figure 20. Unclamped inductive waveform


AM01472v1

Figure 21. Switching time waveform


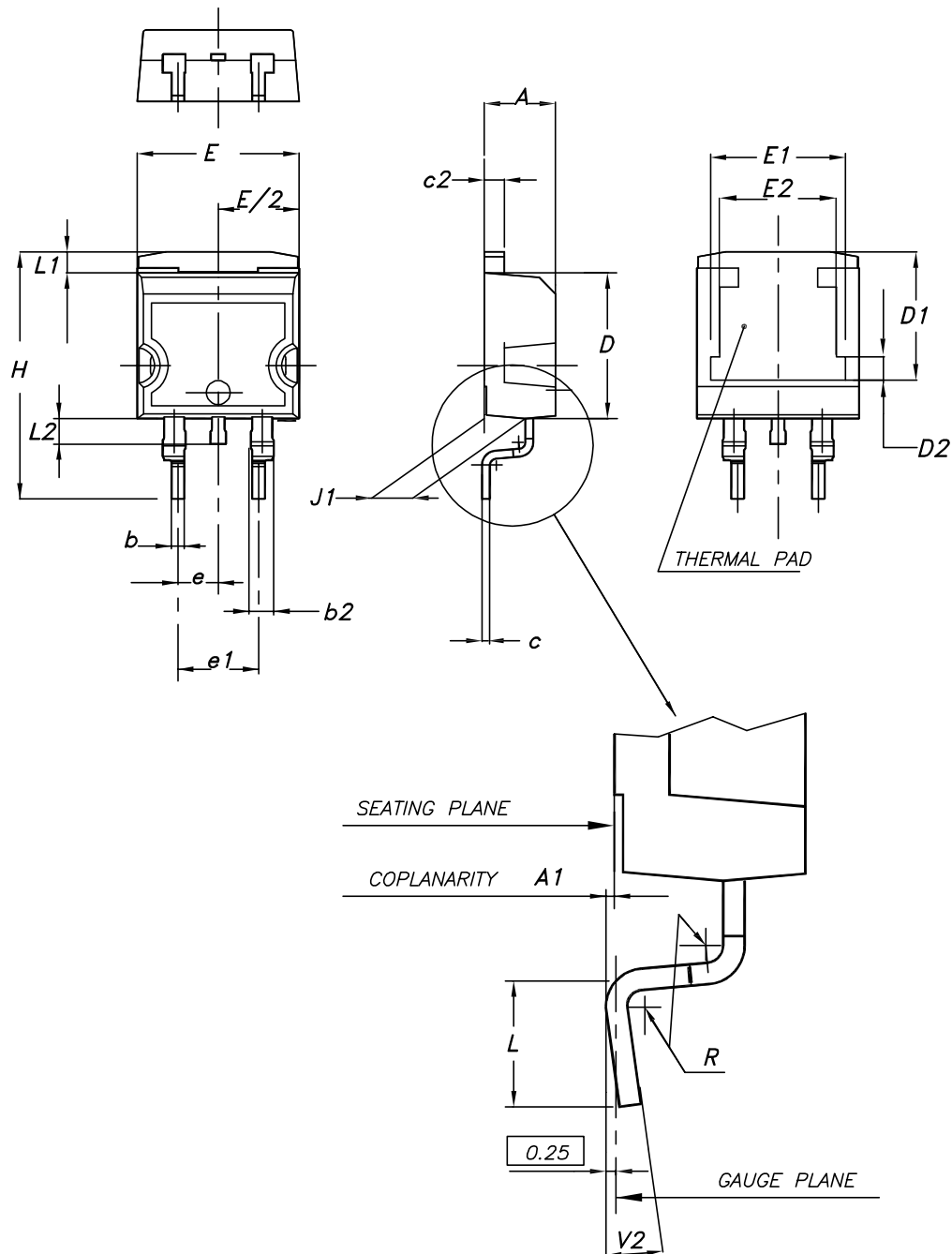
AM01473v1

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

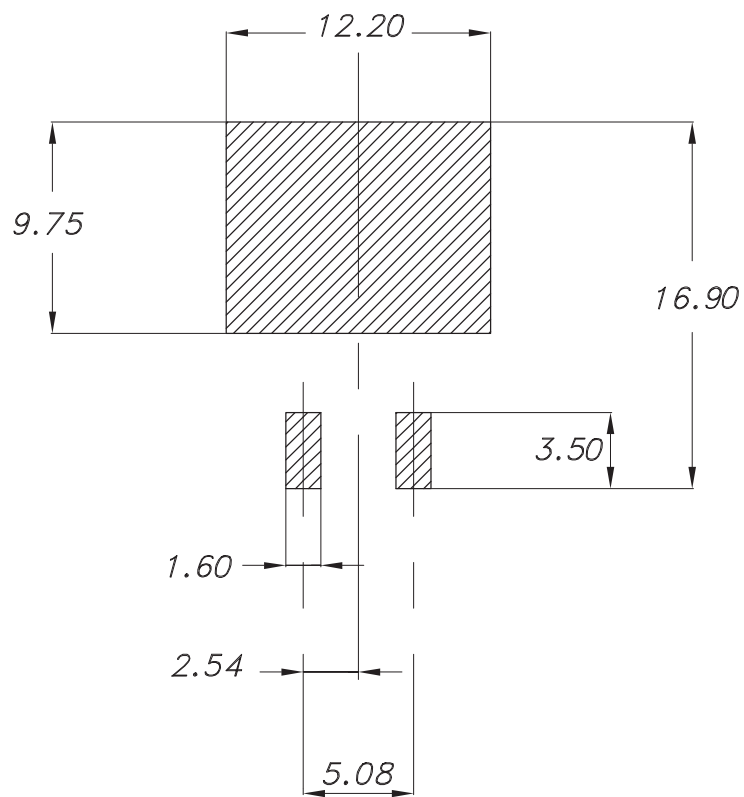


0079457_26

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°

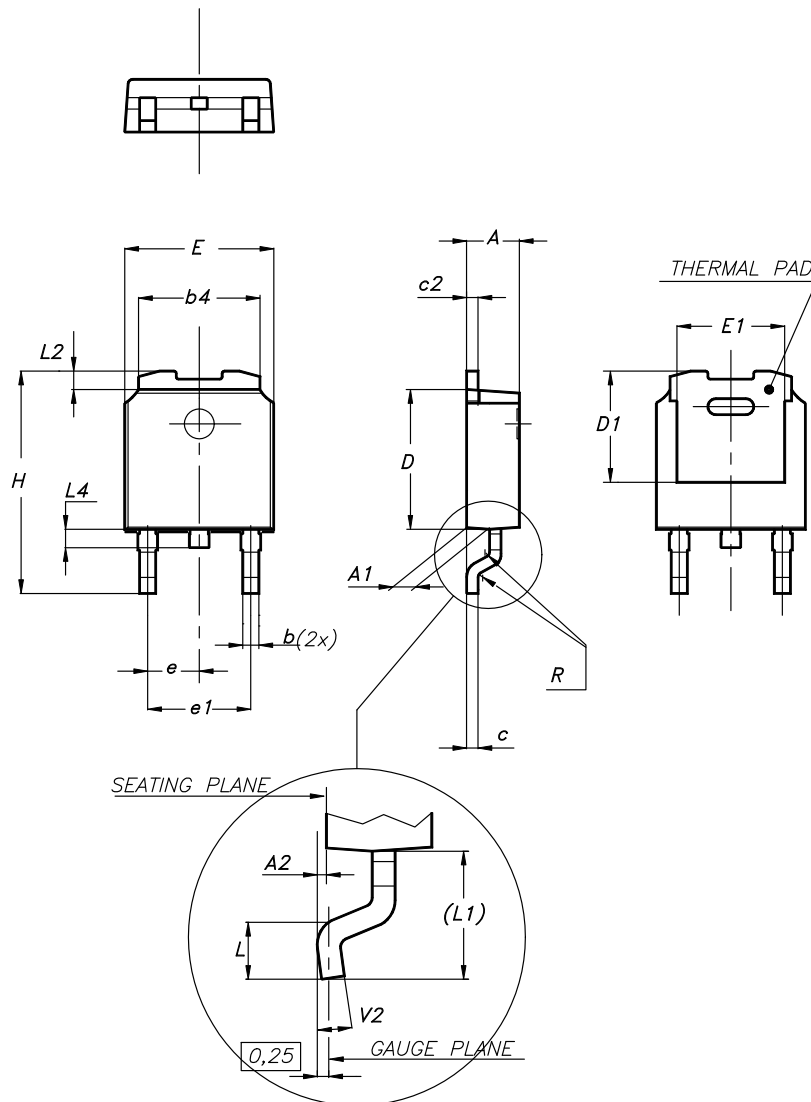
Figure 23. D²PAK (TO-263) recommended footprint (dimensions are in mm)



0079457_Rev26_footprint

4.2 DPAK (TO-252) type A2 package information

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

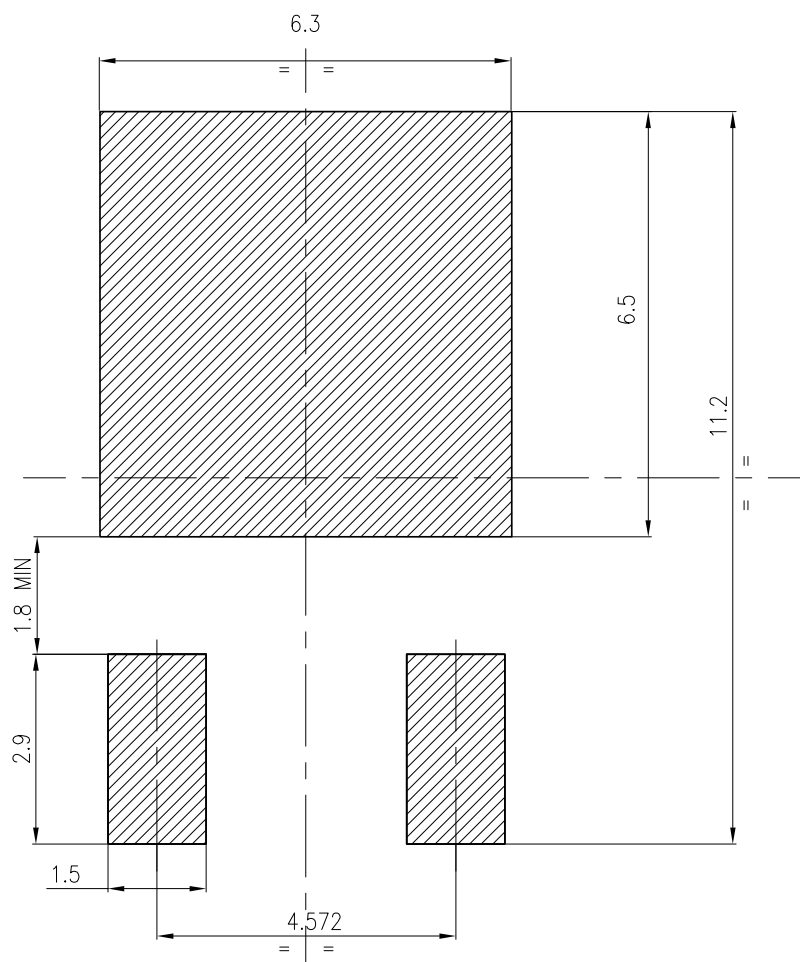


0068772_type-A2_rev30

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°

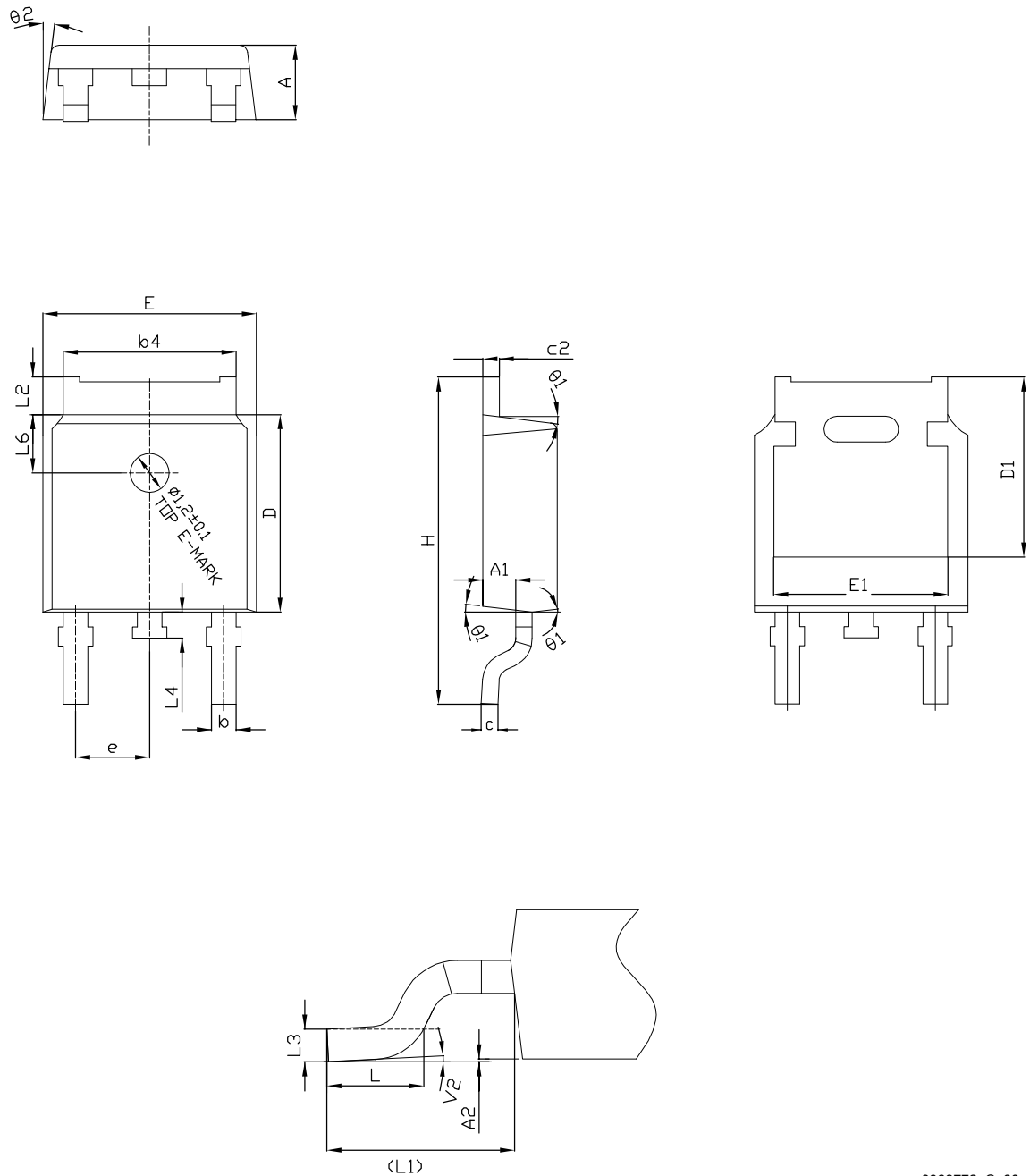
Figure 25. DPAK (TO-252) recommended footprint (dimensions are in mm)



FP_0068772_30

4.3 DPAK (TO-252) type C package information

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

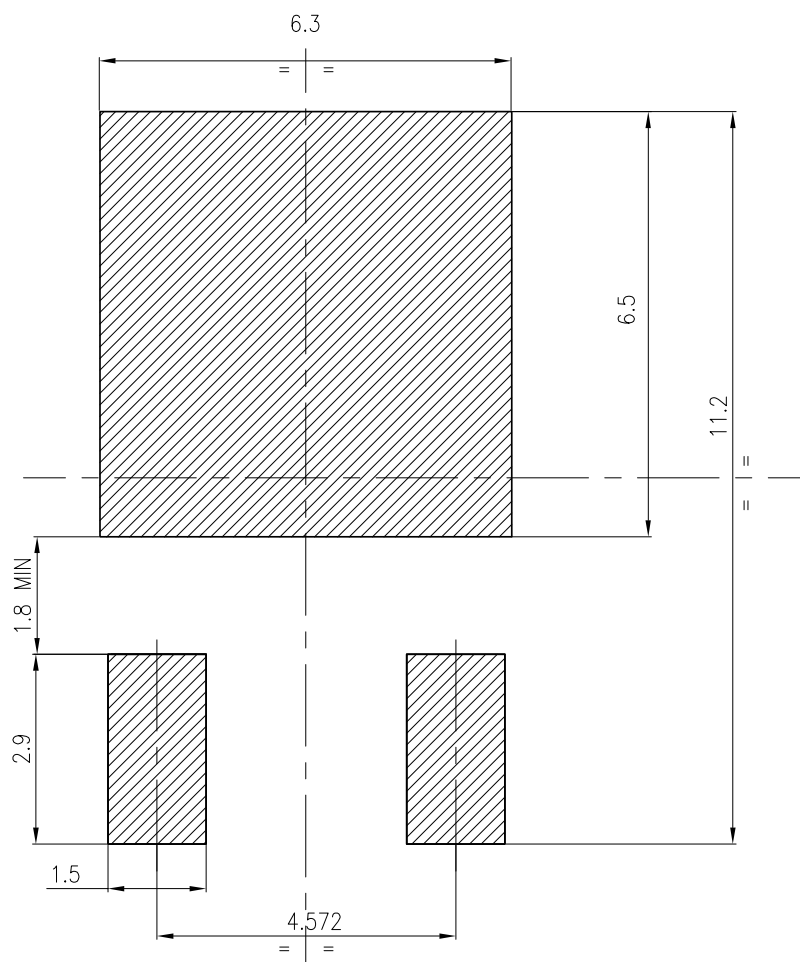


0068772_C_30

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°

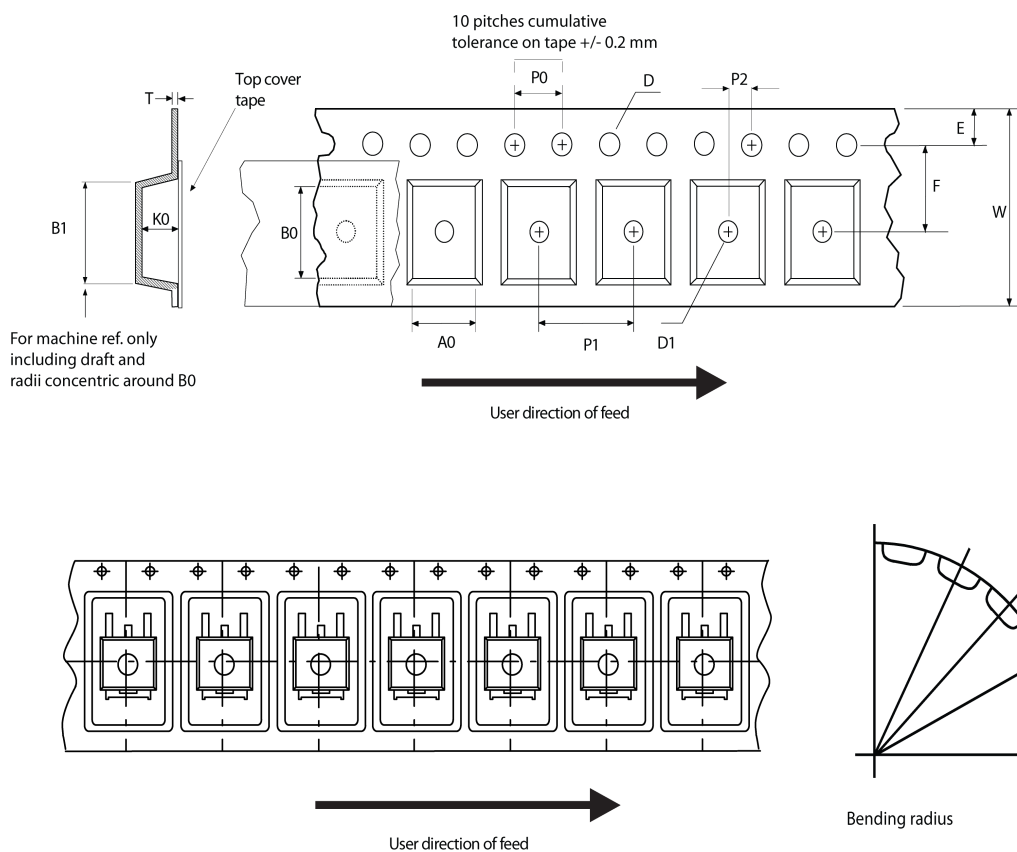
Figure 27. DPAK (TO-252) recommended footprint (dimensions are in mm)



FP_0068772_30

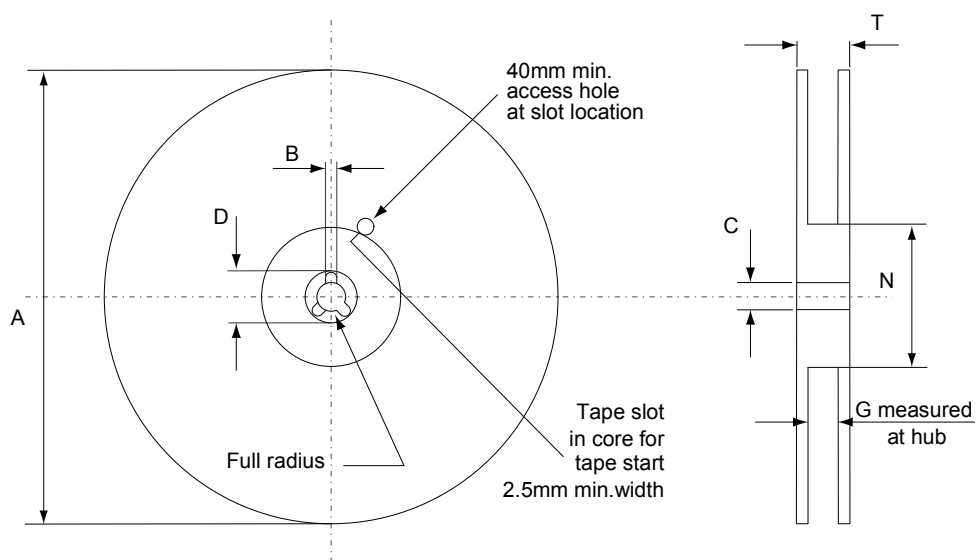
4.4 D²PAK and DPAK packing information

Figure 28. Tape outline



AM08852v1

Figure 29. Reel outline



AM06038v1

Table 11. D²PAK tape and reel mechanical data

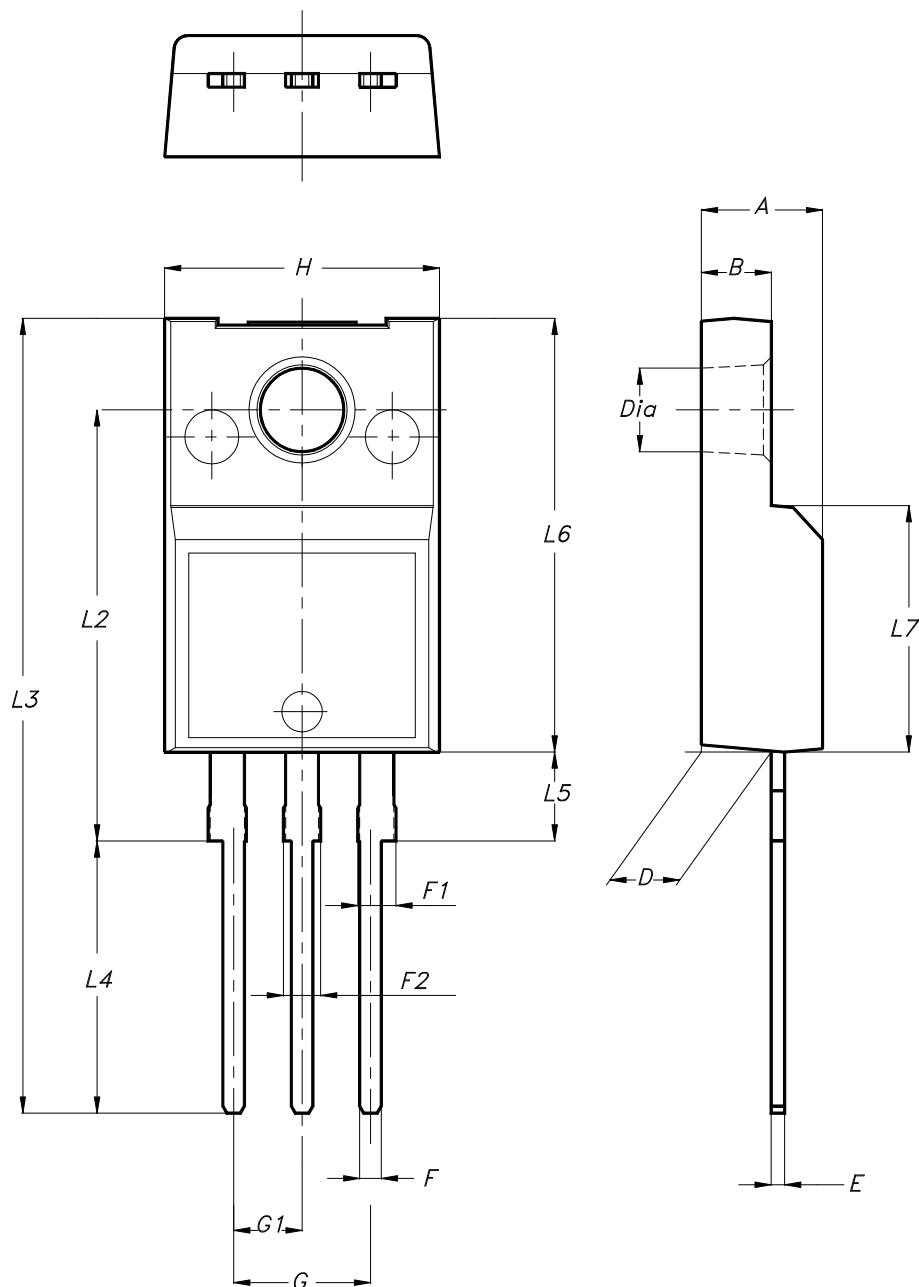
Tape			Reel		
Dim.	mm		Dim.	mm	
	Min.	Max.		Min.	Max.
A0	10.5	10.7	A		330
B0	15.7	15.9	B	1.5	
D	1.5	1.6	C	12.8	13.2
D1	1.59	1.61	D	20.2	
E	1.65	1.85	G	24.4	26.4
F	11.4	11.6	N	100	
K0	4.8	5.0	T		30.4
P0	3.9	4.1			
P1	11.9	12.1	Base quantity		1000
P2	1.9	2.1	Bulk quantity		1000
R	50				
T	0.25	0.35			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



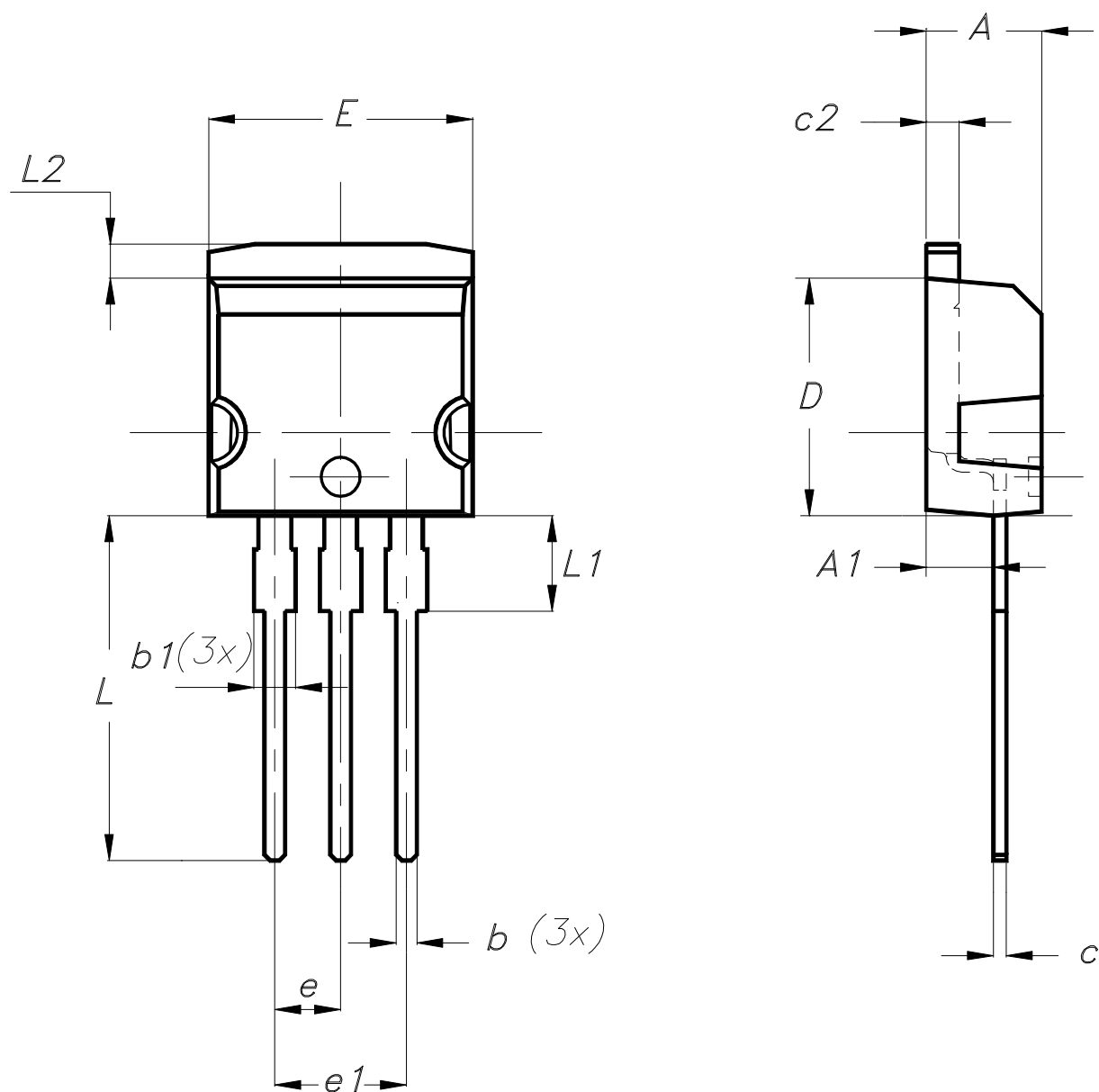
7012510_Rev_13_B

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



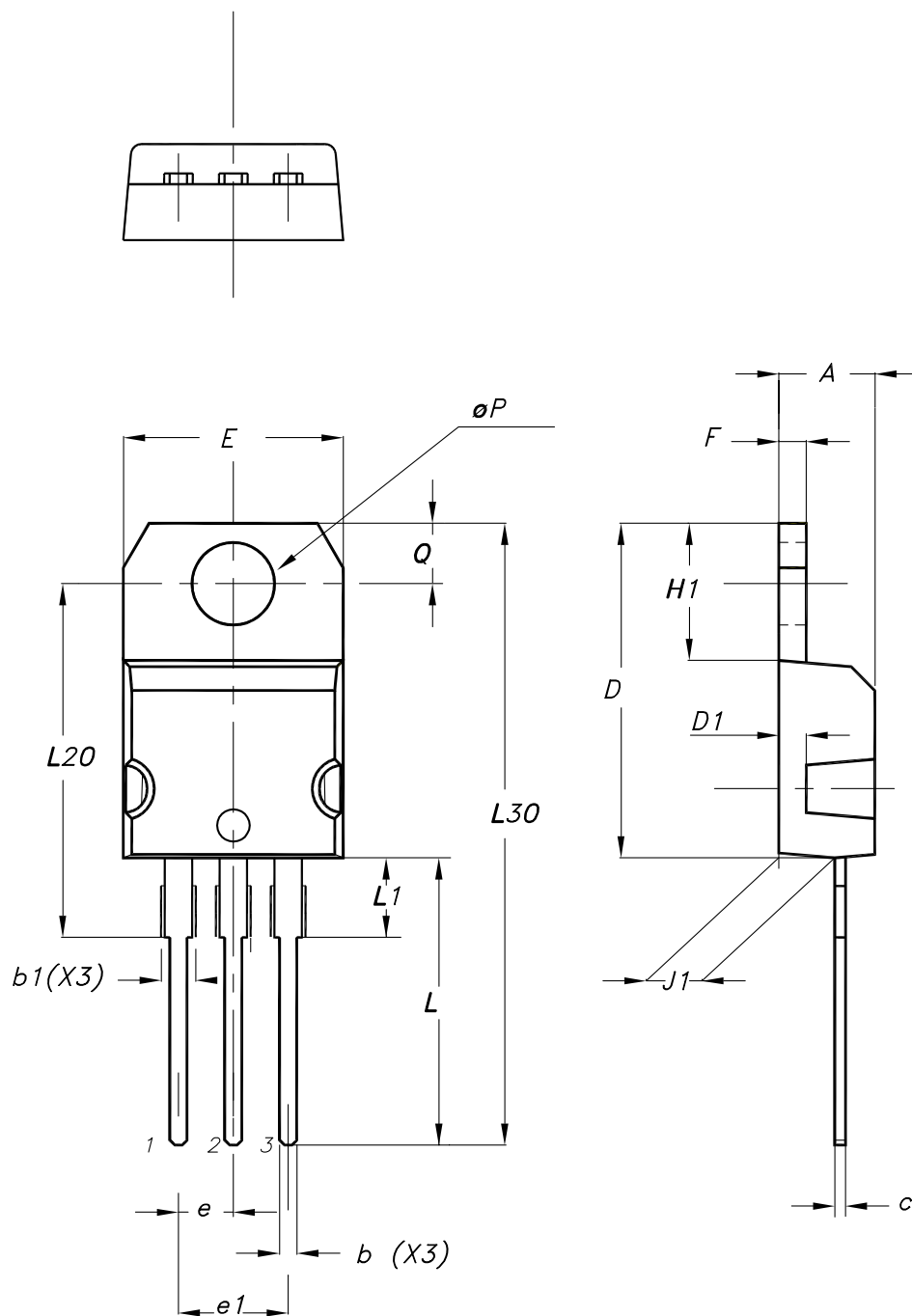
0004982_Rev_9

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	Inserted device in TO-220FP. 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. 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>. Added <i>Section 5: Packaging mechanical data</i>.
29-Apr-2013	3	Modified: the entire typical values in <i>Table 6</i>, <i>t_f</i> typical value in <i>Table 7</i>, VSD and typical values for <i>t_{rr}</i>, <i>q_{rr}</i>, IRRM Inserted: <i>Table 4: Avalanche characteristics</i> and <i>Section 2.1: Electrical characteristics (curves)</i> Minor text changes
25-Nov-2013	4	Inserted device in D²PAK. 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. Updated <i>Table 6: Dynamic</i>, <i>Section 4: Package mechanical data</i> and <i>Section 5: Packaging mechanical data</i>.
18-Jun-2018	5	Added STI100N10F7 device and updated the document accordingly. Removed maturity status indication, updated title, features and description on cover page. Updated <i>Table 1. Absolute maximum ratings</i>. Updated <i>Section 4 Package information</i>. Minor text changes.
02-Mar-2022	6	Updated Section 4 Package information. Minor text changes.



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