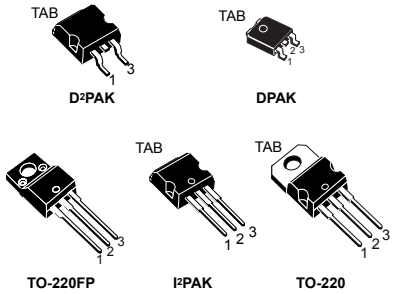
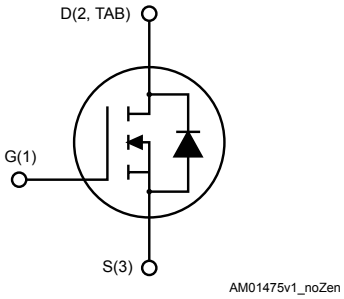
STB100N10F7, STD100N10F7, STF100N10F7
STI100N10F7, STP100N10F7

Datasheet

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





Features

Order codes	V_{DS}	$R_{DS(on)}$ max.	I_D	Package
STB100N10F7	100 V	8.0 mΩ	80 A	D²PAK
STD100N10F7			80 A	DPAK
STF100N10F7			45 A	TO-220FP
STI100N10F7			80 A	I²PAK
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	TO-220 D^2PAK I^2PAK	
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 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^2PAK	DPAK	TO-220FP	TO-220 I^2PAK	
$R_{thj\text{-}case}$	Thermal resistance junction-case	1	1.25	5	1	°C/W
$R_{thj\text{-}amb}$	Thermal resistance junction-ambient			62.5		°C/W
$R_{thj\text{-}pcb}$(1)	Thermal resistance junction-pcb	30	50			°C/W

1. *When mounted on an 1-inch^2 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 °C unless otherwise specified)

Table 4. On-/off-states

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	I_D = 250 µA, V_{GS} = 0 V	100			V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 100 V, V_{GS} = 0 V			1	µA
		V_{DS} = 100 V, V_{GS} = 0 V, T_C = 125 °C(1)			100	µA
I_{GSS}	Gate-body leakage current	V_{GS} = 20 V, V_{DS} = 0 V			100	nA
$V_{GS(th)}$	Gate threshold voltage	V_{DS} = V_{GS}, I_D = 250 µA	2.5		4.5	V
$R_{DS(on)}$	Static drain-source on-resistance	**For D²PAK, DPAK, I²PAK and TO-220**: V_{GS} = 10 V, I_D = 40 A **For TO-220FP:** V_{GS} = 10 V, I_D = 22.5 A		6.8	8.0	mΩ

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 V, f = 1 MHz, V_{GS} = 0 V	-	4369	-	pF
C_{oss}	Output capacitance		-	823	-	pF
C_{rss}	Reverse transfer capacitance		-	36	-	pF
Q_g	Total gate charge	V_{DD} = 50 V, I_D = 80 A, V_{GS} = 0 to 10 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 V, I_D = 40 A, R_G = 4.7 Ω, V_{GS} = 10 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 A, V_{GS} = 0 V	-		1.2	V
t_{rr}	Reverse recovery time	I_{SD} = 80 A, di/dt = 100 A/µs	-	77		ns
Q_{rr}	Reverse recovery charge	V_{DD} = 80 V, T_J = 150 °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

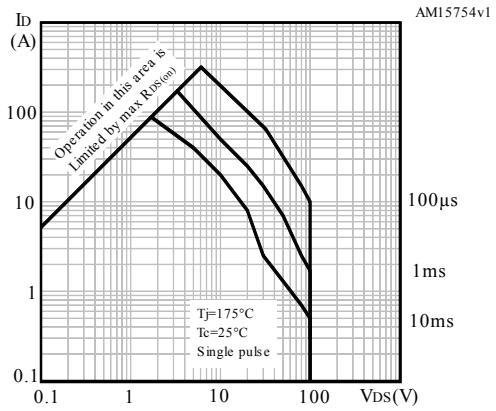


Figure 2. Thermal impedance for DPAK

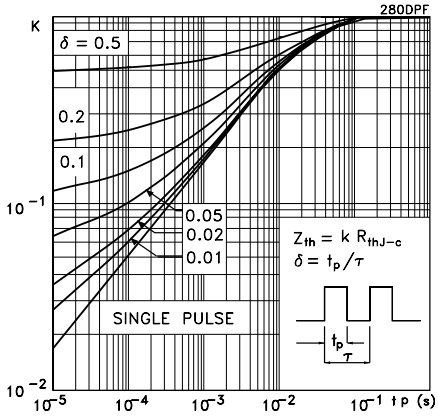


Figure 3. Safe operating area for TO-220FP

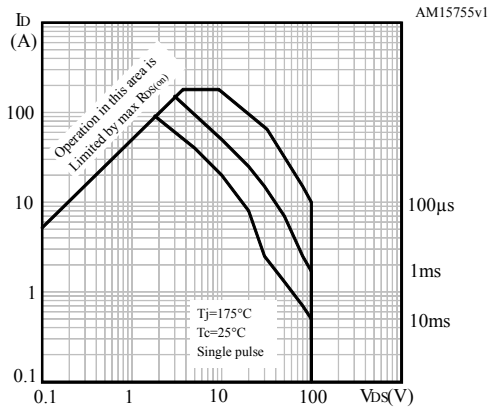


Figure 4. Thermal impedance for TO-220FP

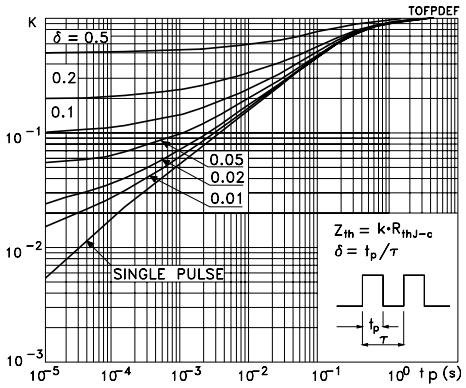


Figure 5. Safe operating area for D²PAK, I²PAK and TO-220

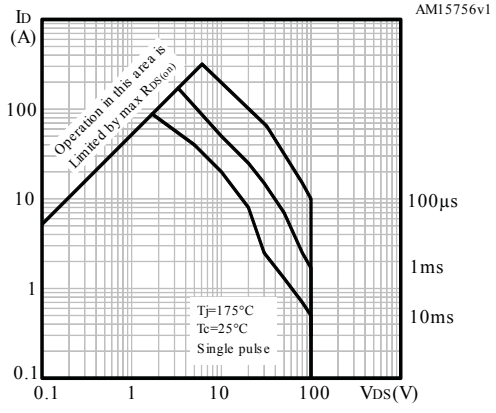


Figure 6. Thermal impedance for D²PAK, I²PAK and TO-220

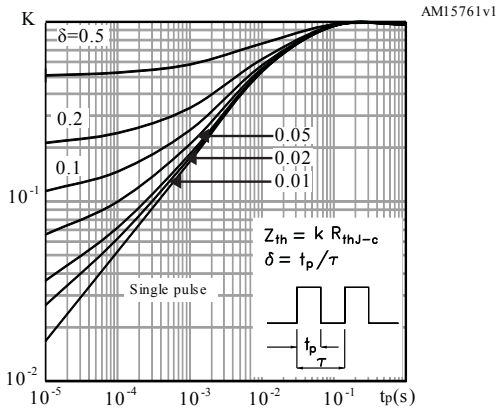


Figure 7. Output characteristics

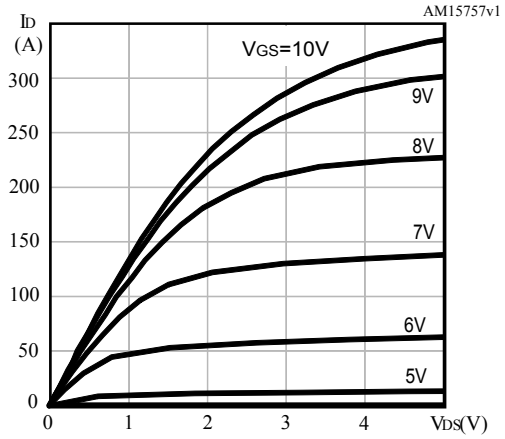


Figure 8. Transfer characteristics

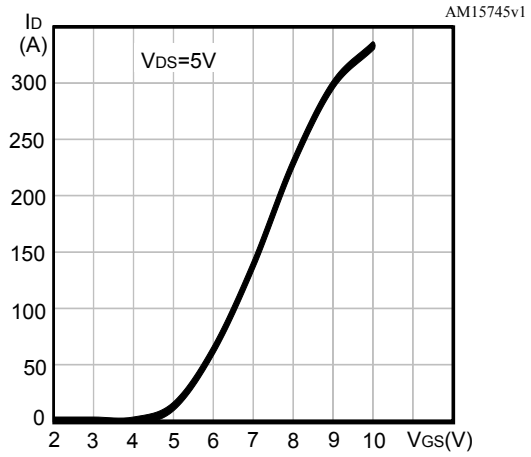


Figure 9. Normalized $V_{(BR)DSS}$ vs temperature

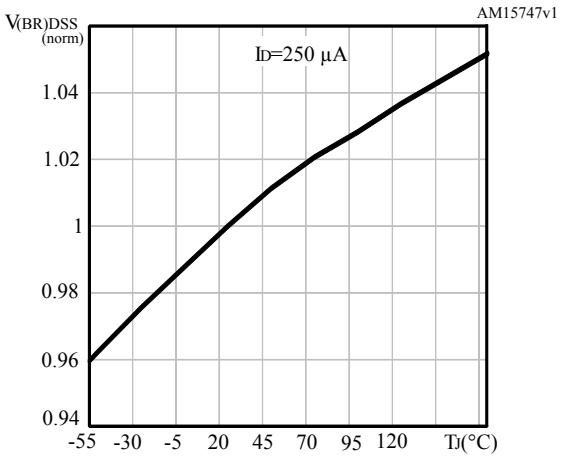


Figure 10. Static drain-source on-resistance

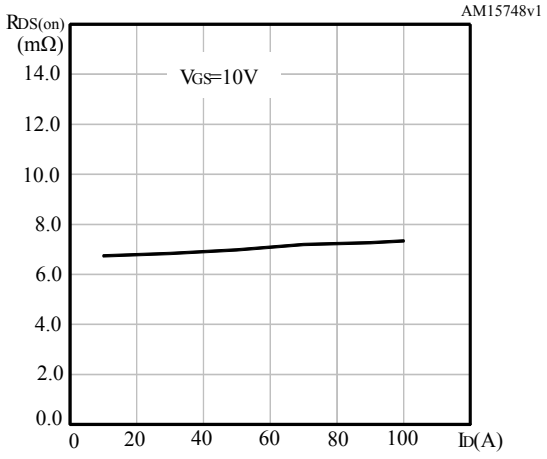


Figure 11. Gate charge vs gate-source voltage

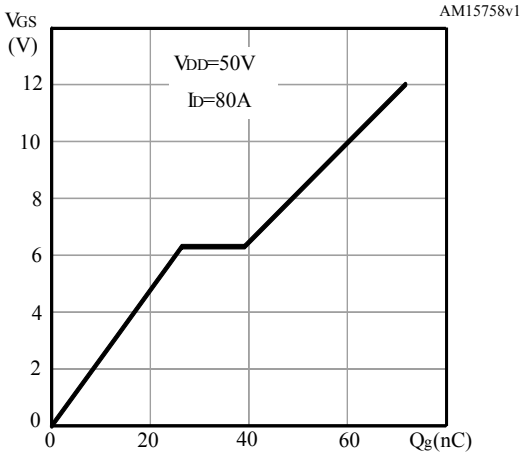


Figure 12. Capacitance variations

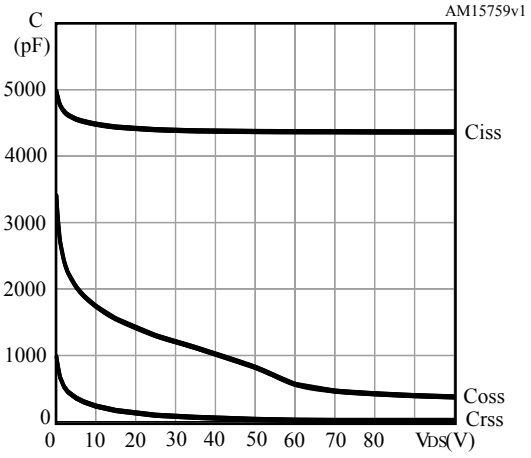


Figure 13. Normalized gate threshold voltage vs temperature

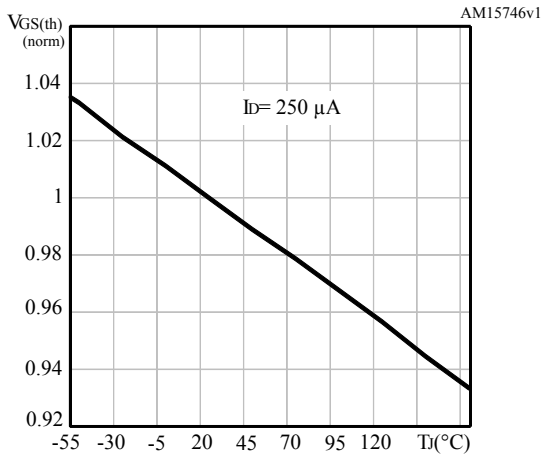


Figure 14. Normalized on-resistance vs temperature

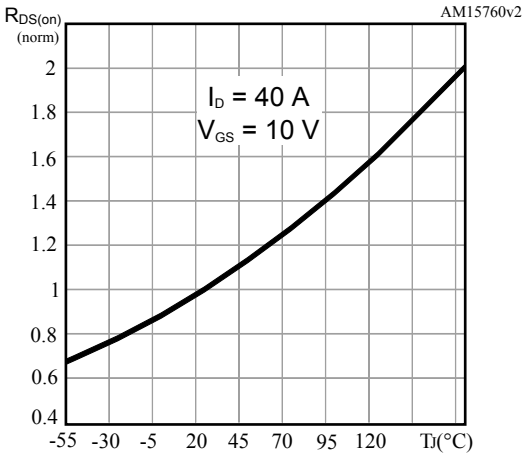
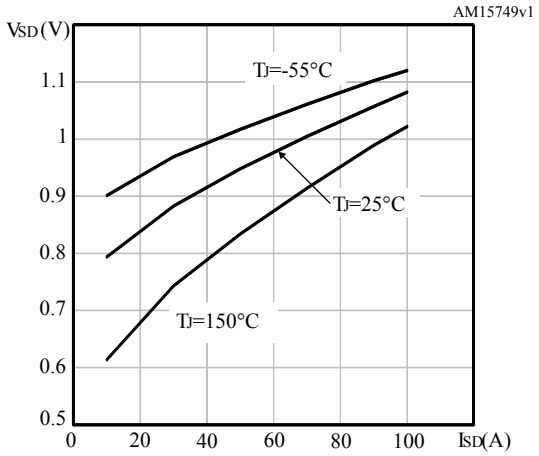


Figure 15. Source-drain diode forward characteristics



3 Test circuits

Figure 16. Test circuit for resistive load switching times

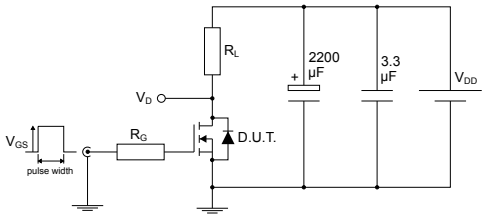


Figure 17. Test circuit for gate charge behavior

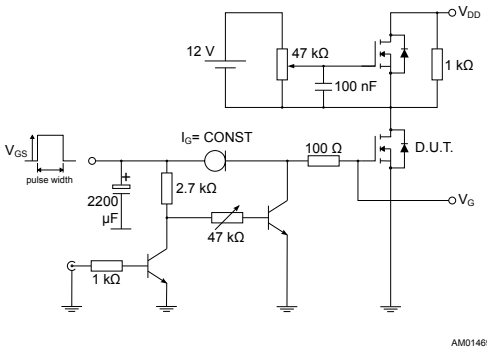


Figure 18. Test circuit for inductive load switching and diode recovery times

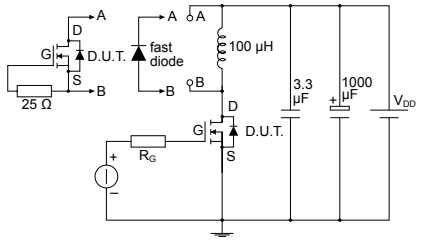


Figure 19. Unclamped inductive load test circuit

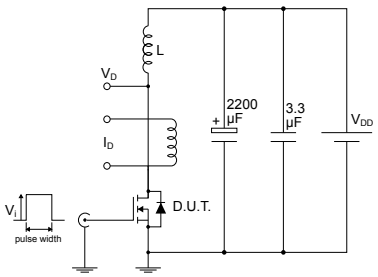


Figure 20. Unclamped inductive waveform

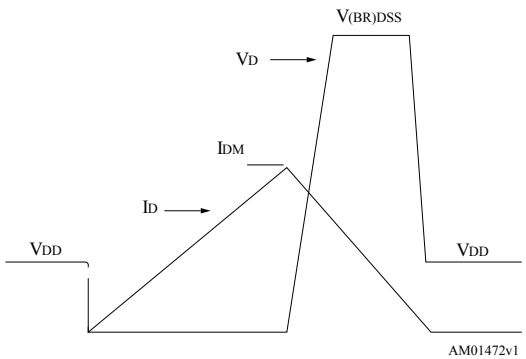
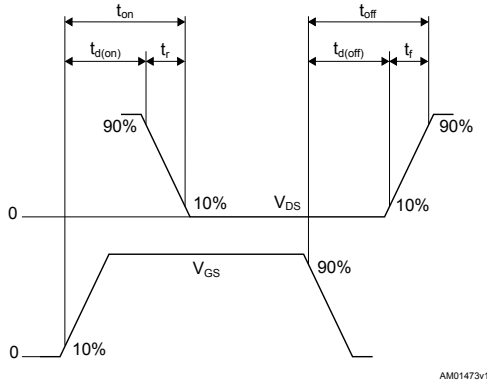


Figure 21. Switching time waveform



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 D²PAK (TO-263) type A package information

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

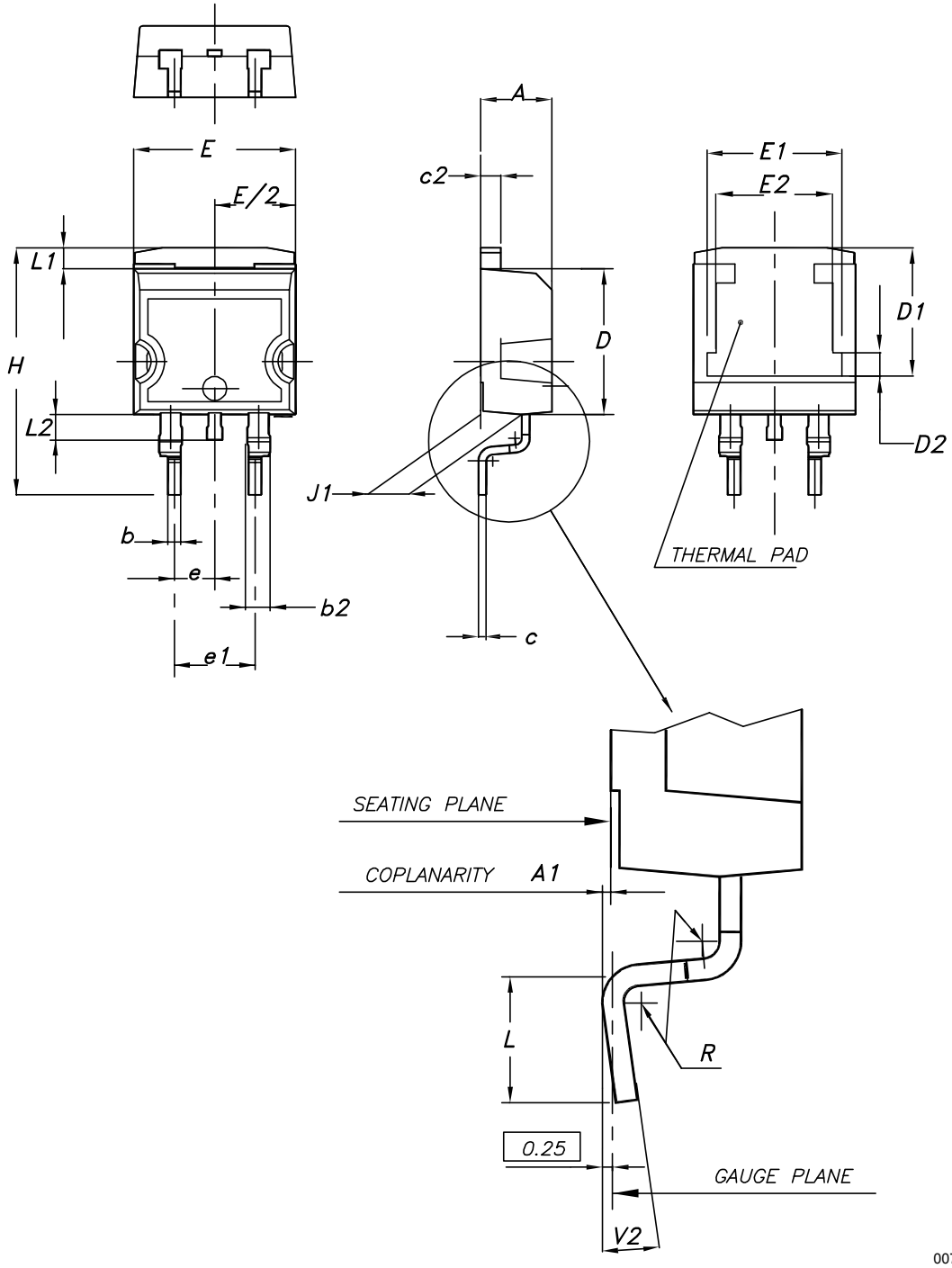
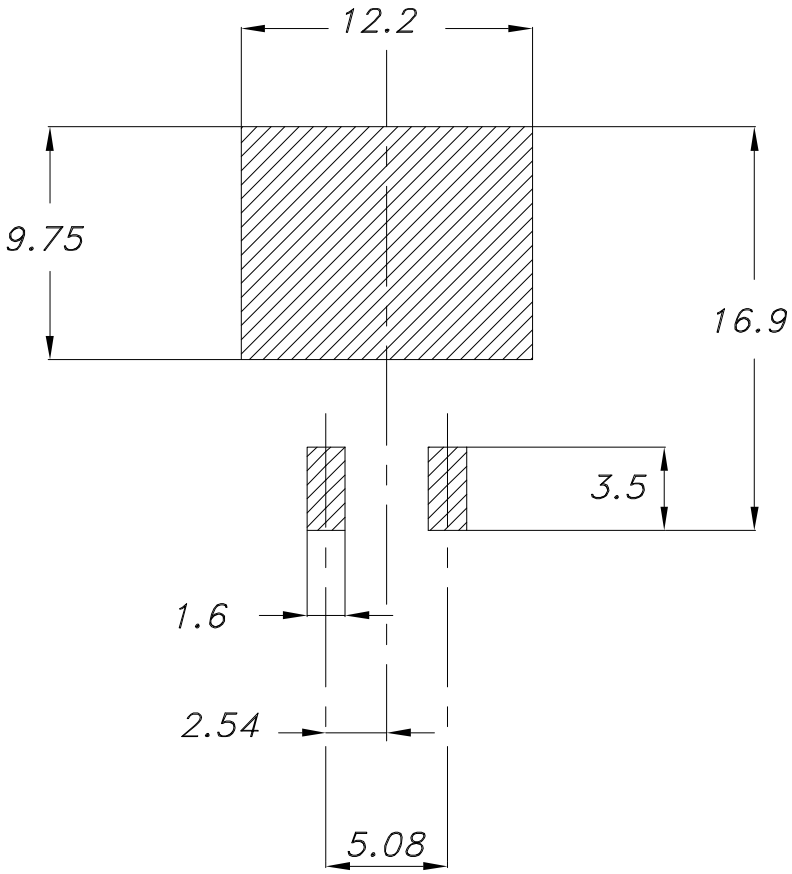


Table 8. D²PAK (TO-263) type A package mechanical data

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)**



Footprint

4.2 DPAK (TO-252) type A2 package information

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

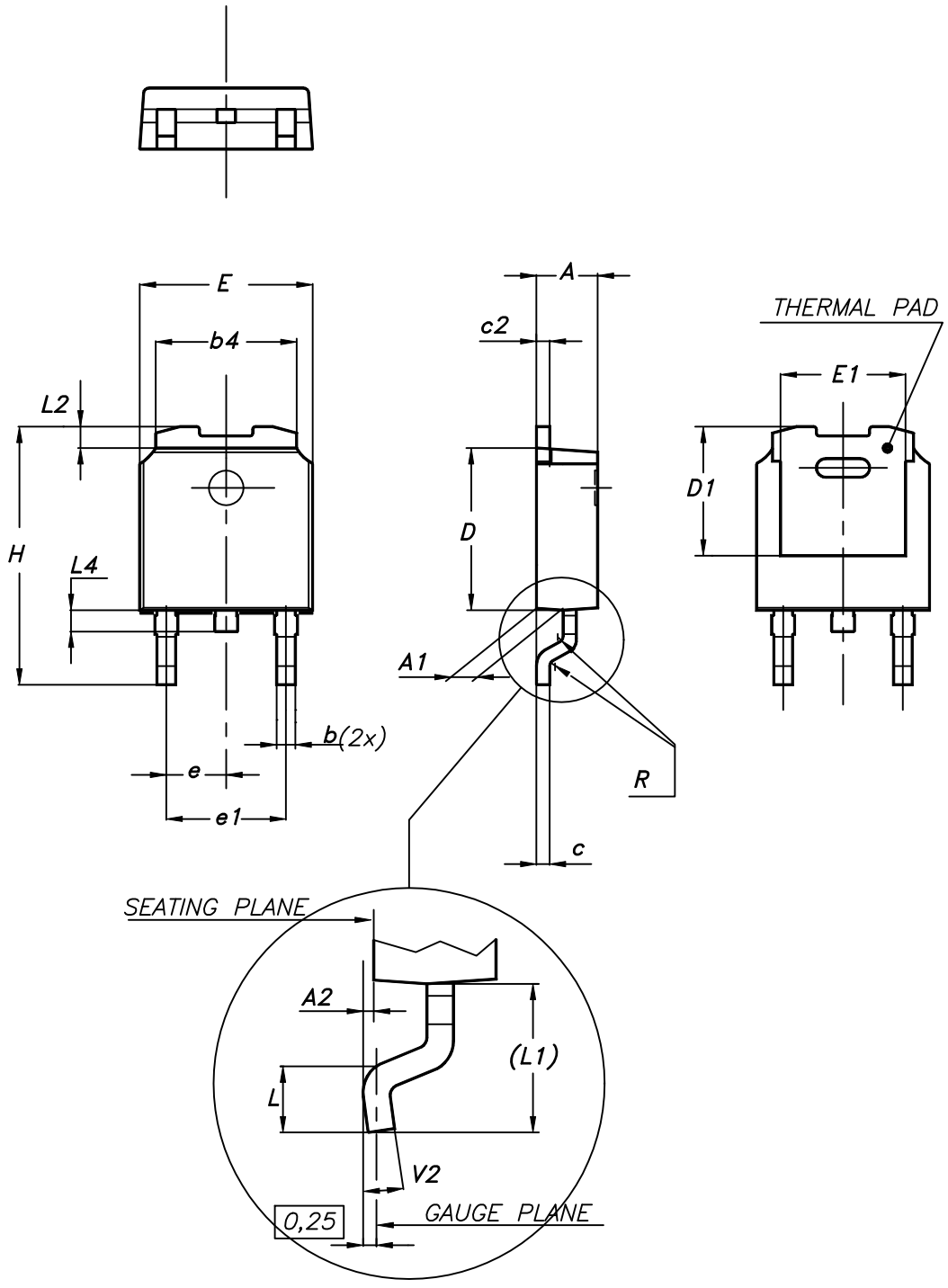
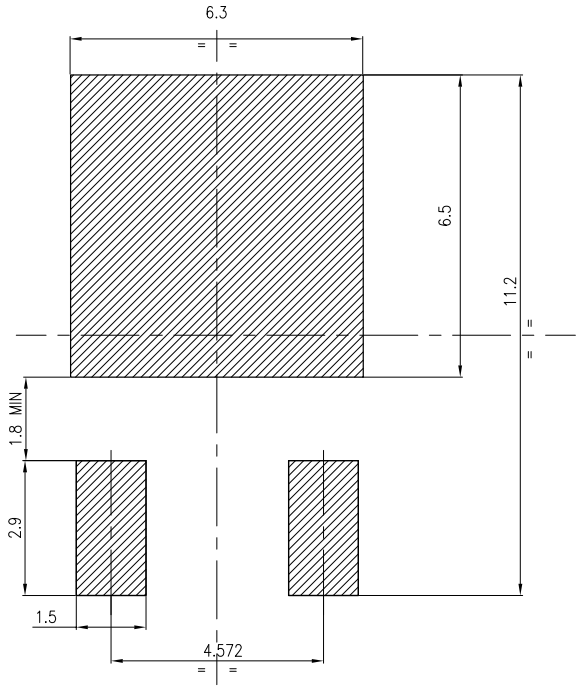


Table 9. DPAK (TO-252) type A2 mechanical data

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)**



4.3 D²PAK and DPAK packing information

Figure 26. Tape outline

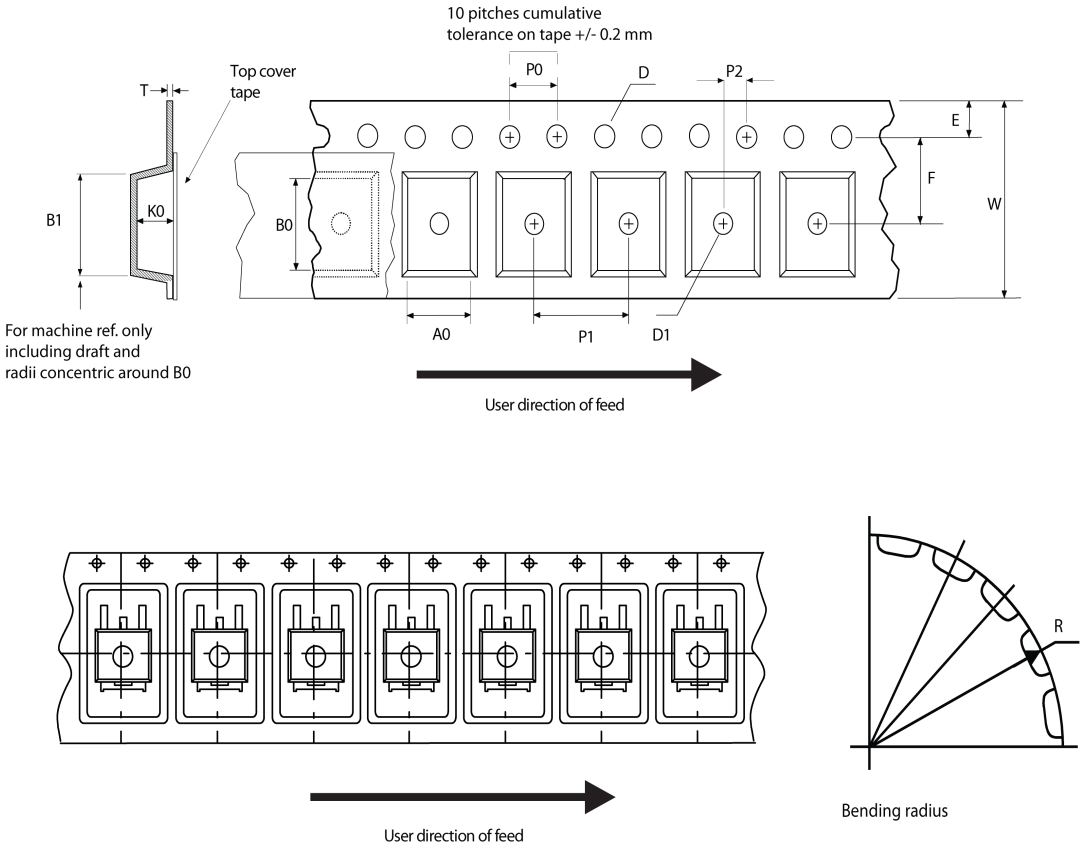
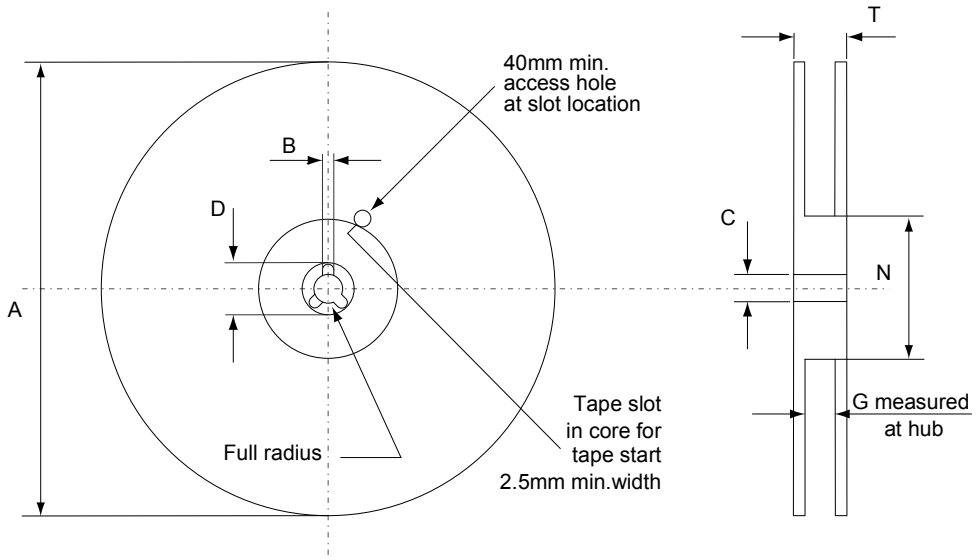


Figure 27. **Reel outline**



AM06038v1

Table 10. **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 11. **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			

4.4 TO-220FP package information

Figure 28. **TO-220FP package outline**

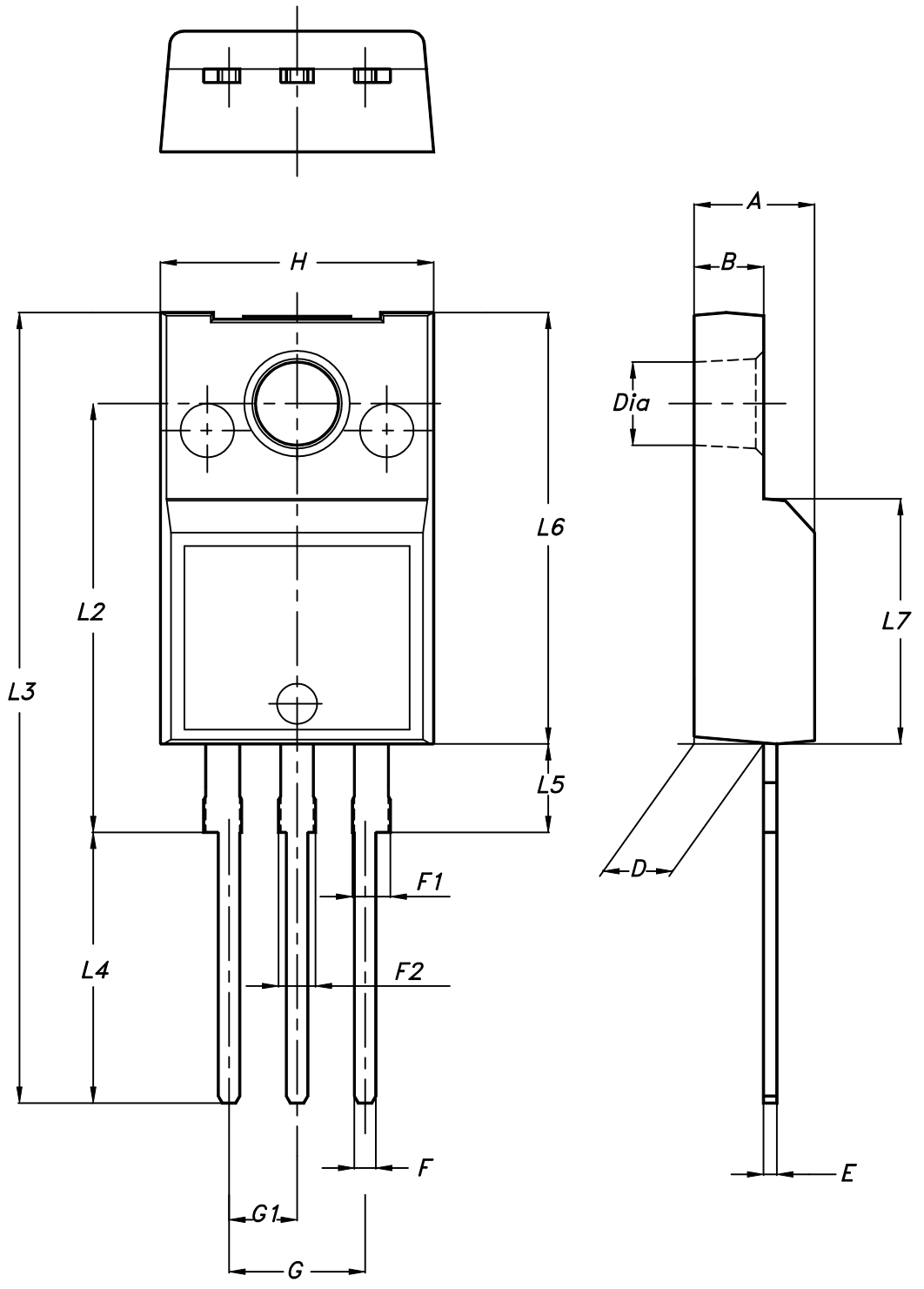


Table 12. **TO-220FP package mechanical data**

Dim.	mm		
	Min.	Typ.	Max.
A	4.4		4.6
B	2.5		2.7
D	2.5		2.75
E	0.45		0.7
F	0.75		1
F1	1.15		1.70
F2	1.15		1.70
G	4.95		5.2
G1	2.4		2.7
H	10		10.4
L2		16	
L3	28.6		30.6
L4	9.8		10.6
L5	2.9		3.6
L6	15.9		16.4
L7	9		9.3
Dia	3		3.2

4.5 I²PAK package information

Figure 29. I²PAK package outline

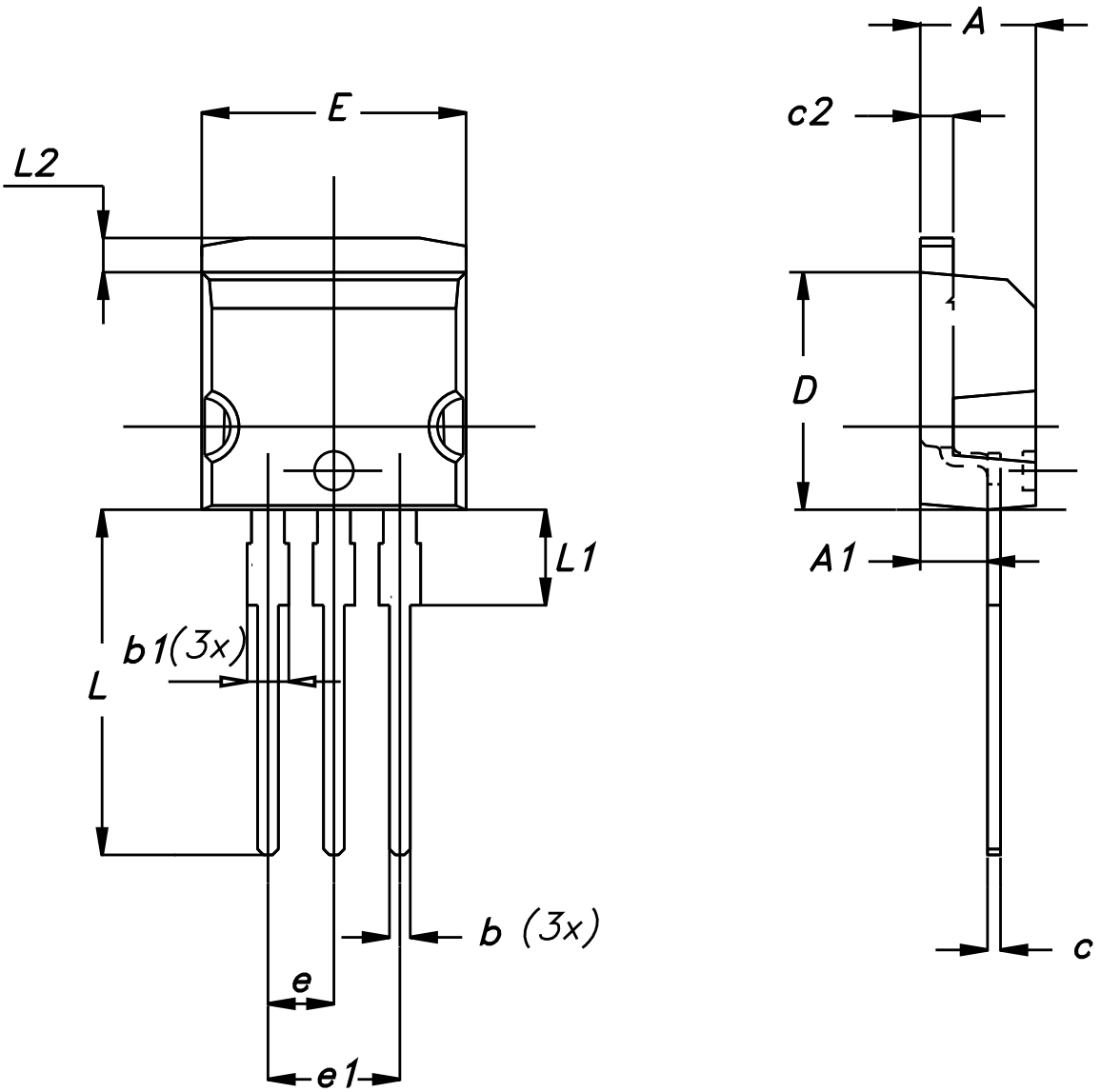


Table 13. I²PAK package mechanical data

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	-	10.40
L	13	-	14
L1	3.50	-	3.93
L2	1.27	-	1.40

4.6 TO-220 type A package information

Figure 30. **TO-220 type A package outline**

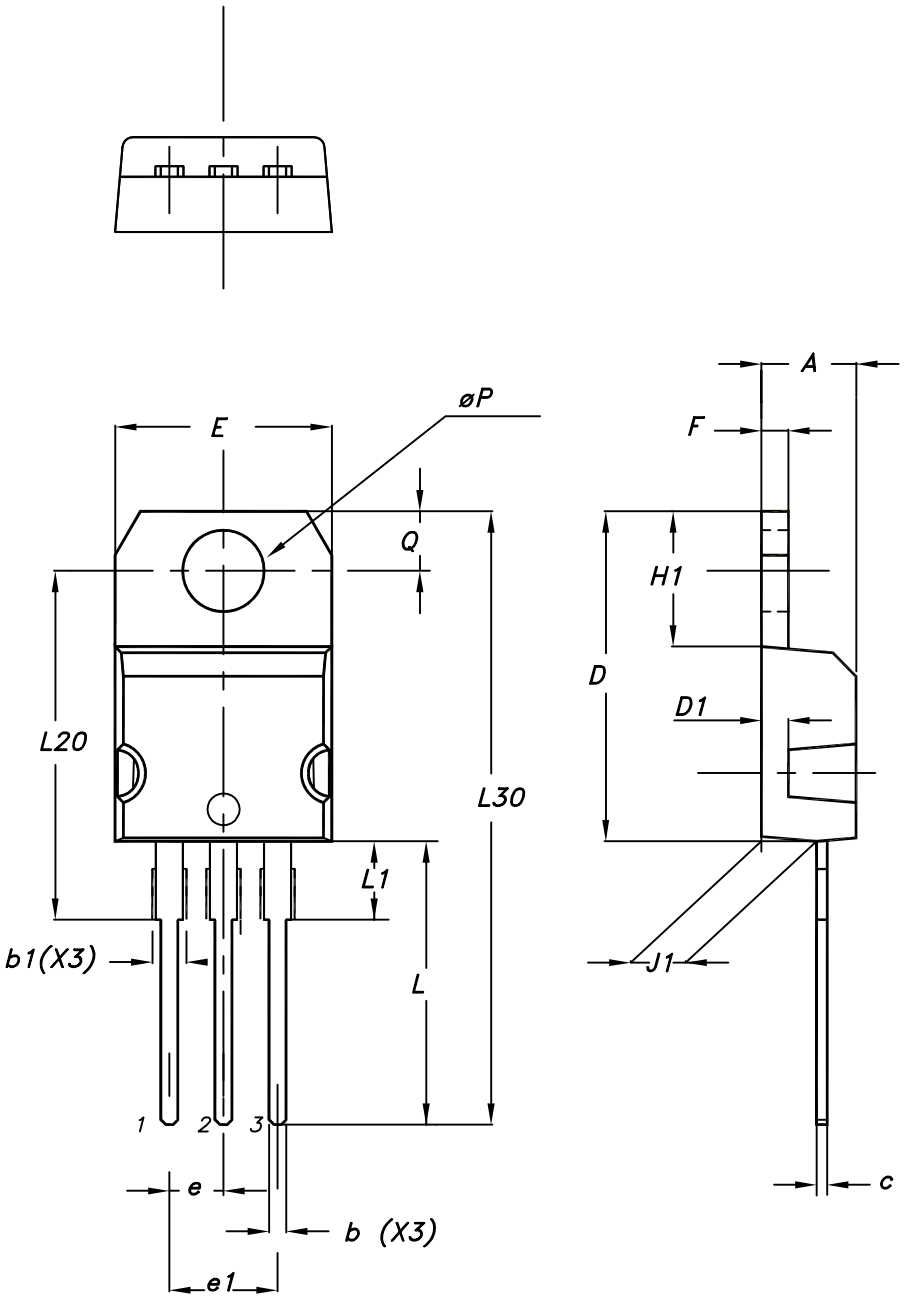


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Table 14. **TO-220 type A package mechanical data**

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

5 Ordering information

Table 15. **Order codes**

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

Revision history

Table 16. **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, *Table 1: Device summary, Table 2: Absolute maximum ratings, Table 3: Thermal resistance* and *Table 5: On/off states* accordingly. Updated *Table 6: Dynamic, Table 7: Switching times, Table 8: Source drain diode* and *Section 4: Package mechanical data.* Added *Section 5: Packaging mechanical data*.
29-Apr-2013	3	Modified: the entire typical values in *Table 6*, tf typical value in *Table 7*, VSD and typical values for trr, qrr, IRRM Inserted: *Table 4: Avalanche characteristics* and *Section 2.1: Electrical characteristics (curves)* Minor text changes
25-Nov-2013	4	Inserted device in D^2PAK. Updated title and features on the cover page, *Table 1: Device summary, Table 2: Absolute maximum ratings, Table 3: Thermal resistance* and *Table 5: On/off states* accordingly. Updated *Table 6: Dynamic, Section 4: Package mechanical data* and *Section 5: Packaging mechanical data*.
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 Table 1. Absolute maximum ratings. Updated Section 4 Package information. Minor text changes

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