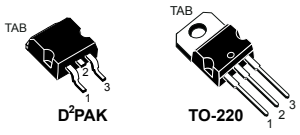
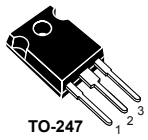
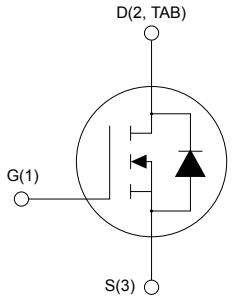
STB46NF30, STP46NF30, STW46NF30

Datasheet

Automotive-grade N-channel 300 V, 71 mΩ typ., 42 A STripFET II Power MOSFETs in D²PAK, TO-220 and TO-247 packages







Features

Order code	V_{DS}	$R_{DS(on)}$ max.	I_D
STB46NF30	300 V	75 mΩ	42 A
STP46NF30			
STW46NF30			

- AEC-Q101 qualified
- Exceptional dv/dt capability
- 100% avalanche tested
- Low gate charge
- 175 °C maximum junction temperature

Applications

- Switching applications

Description

These Power MOSFETs have been developed using STMicroelectronics' unique STripFET process, which is specifically designed to minimize input capacitance and gate charge. This renders the devices suitable for use as primary switch in advanced high-efficiency isolated DC-DC converters for telecom and computer applications, and applications with low gate charge driving requirements.

Product status links
STB46NF30
STP46NF30
STW46NF30

1 Electrical ratings

Table 1. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source voltage	300	V
V_{GS}	Gate-source voltage	±20	V
I_D	Drain current (continuous) at T_C = 25 °C	42	A
	Drain current (continuous) at T_C = 100 °C	27	
I_{DM}(1)	Drain current (pulsed)	168	A
P_{TOT}	Total power dissipation at T_C = 25 °C	300	W
dv/dt(2)	Peak diode recovery voltage slope	10	V/ns
T_{stg}	Storage temperature range	-55 to 175	°C
T_J	Operating junction temperature range		°C

1. *Pulse width limited by safe operating area.*
2. *I_{SD} ≤ 34 A, di/dt ≤ 200 A/µs, V_{DD} = 240 V, V_{DS} (peak) < $V_{(BR)DSS}$*

Table 2. Thermal data

Symbol	Parameter	Value			Unit
		D^2PAK	TO-220	TO-247	
R_{thJC}	Thermal resistance, junction-to-case		0.5		°C/W
R_{thJA}	Thermal resistance, junction-to-ambient	30(1)	62.5	50	°C/W

1. *When mounted on a standard 1 inch^2 area of FR-4 PCB with 2-oz copper.*

Table 3. Avalanche characteristics

Symbol	Parameter	Value	Unit
I_{AR}	Avalanche current, repetitive or not-repetitive (pulse width limited by T_J max.)	26	A
E_{AS}	Single pulse avalanche energy (starting T_J = 25 °C, I_D = I_{AR}, V_{DD} = 50 V)	290	mJ

2 Electrical characteristics

T_C = 25 °C unless otherwise specified.

Table 4. On/off states

Symbol	Parameter	Test condition	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	I_D = 1 mA, V_{GS} = 0 V	300			V
I_{DSS}	Zero gate voltage drain current	V_{GS} = 0 V, V_{DS} = 300 V			1	µA
		V_{GS} = 0 V, V_{DS} = 300 V, T_C = 125 °C(1)			10	µA
I_{GSS}	Gate body leakage current	V_{DS} = 0 V, V_{GS} = ±20 V			±100	nA
$V_{GS(th)}$	Gate threshold voltage	V_{DS} = V_{GS}, I_D = 250 µA	2	3	4	V
$R_{DS(on)}$	Static drain-source on-resistance	V_{GS} = 10 V, I_D = 17 A		71	75	mΩ

1. *Specified by design, not tested in production.*

Table 5. Dynamic

Symbol	Parameter	Test condition	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	V_{DS} = 25 V, f = 1 MHz, V_{GS} = 0 V	-	3200	-	pF
C_{oss}	Output capacitance		-	442	-	pF
C_{rss}	Reverse transfer capacitance		-	57	-	pF
Q_g	Total gate charge	V_{DD} = 240 V, I_D = 34 A, V_{GS} = 0 to 10 V (see Figure 16. Test circuit for gate charge behavior)	-	90	-	nC
Q_{gs}	Gate-source charge		-	16	-	nC
Q_{gd}	Gate-drain charge		-	40	-	nC

Table 6. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	V_{DD} = 150 V, I_D = 17 A, R_G = 4.7 Ω , V_{GS} = 10 V (see Figure 15. Test circuit for resistive load switching times and Figure 20. Switching time waveform)	-	25	-	ns
t_r	Rise time		-	38	-	ns
$t_{d(off)}$	Turn-off delay time		-	80	-	ns
t_f	Fall time		-	46	-	ns

Table 7. Source-drain diode

Symbol	Parameter	Test condition	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain current		-		34	A
I_{SDM}(1)	Source-drain current (pulsed)		-		136	A
V_{SD}(2)	Forward on voltage	I_{SD} = 34 A, V_{GS} = 0 V	-		1.6	V
t_{rr}	Reverse recovery time	I_{SD} = 34 A, di/dt = 100 A/µs	-	215		ns
Q_{rr}	Reverse recovery charge	V_{DD} = 60 V (see Figure 17. Test circuit for inductive load switching and diode recovery times)	-	1.7		µC
I_{RRM}	Reverse recovery current		-	16		A
t_{rr}	Reverse recovery time	I_{SD} = 34 A, di/dt = 100 A/µs	-	252		ns
Q_{rr}	Reverse recovery charge	V_{DD} = 60 V, T_J = 150 °C (see Figure 17. Test circuit for inductive load switching and diode recovery times)	-	2.3		µC
I_{RRM}	Reverse recovery current		-	19		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 D²PAK and TO-220

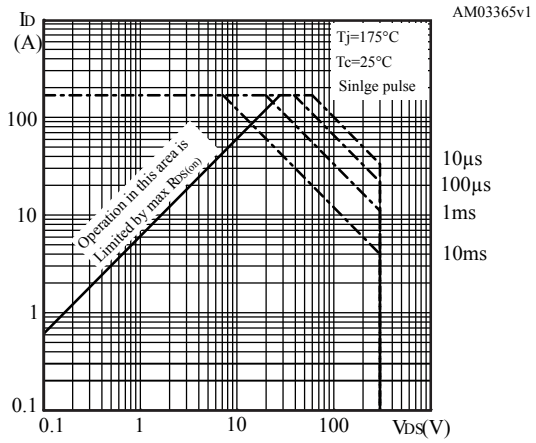


Figure 2. Normalized transient thermal impedance for D²PAK and TO-220

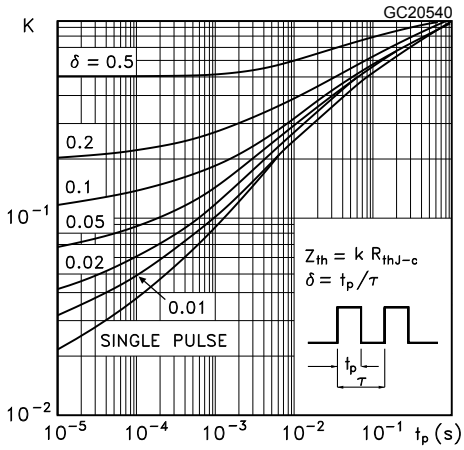


Figure 3. Safe operating area for TO-247

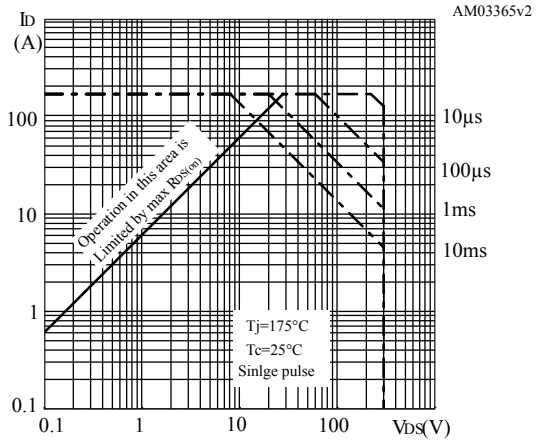


Figure 4. Normalized transient thermal impedance for TO-247

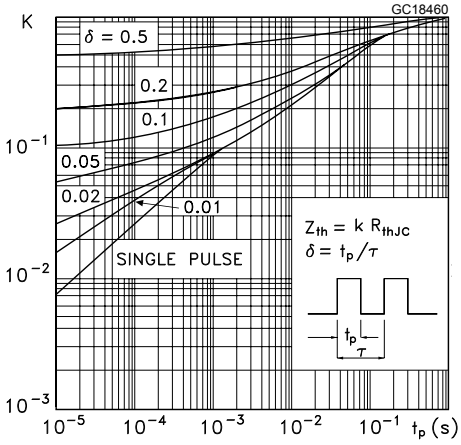


Figure 5. Typical output characteristics

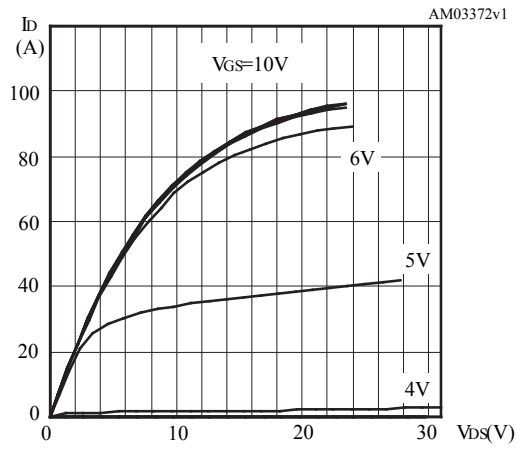


Figure 6. Typical transfer characteristics

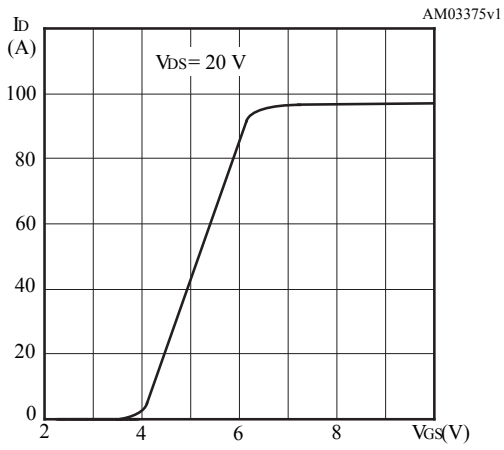


Figure 7. Typical gate charge vs gate-source voltage

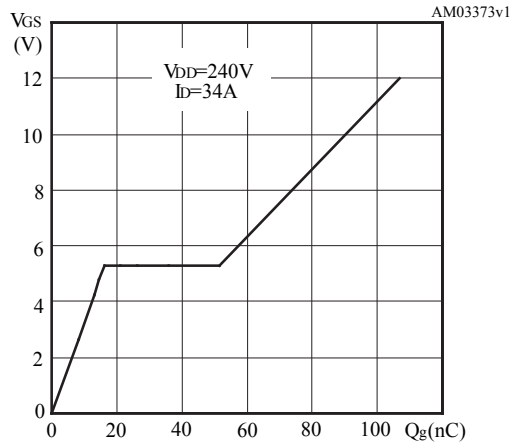


Figure 8. Typical static drain-source on-resistance

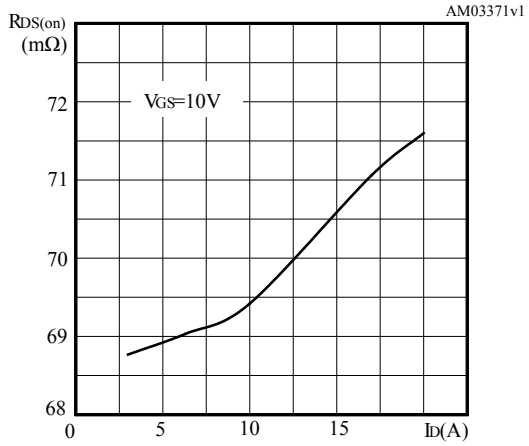


Figure 9. Typical capacitance variations

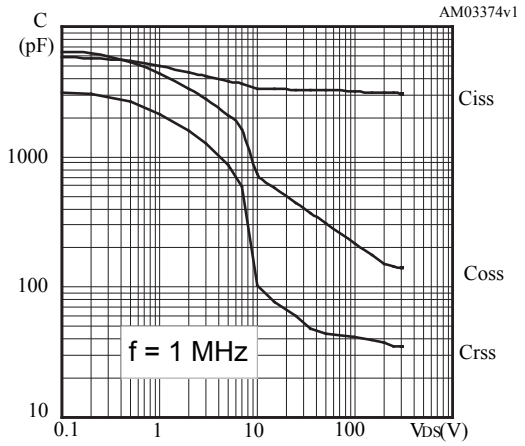


Figure 10. Typical output capacitance stored energy

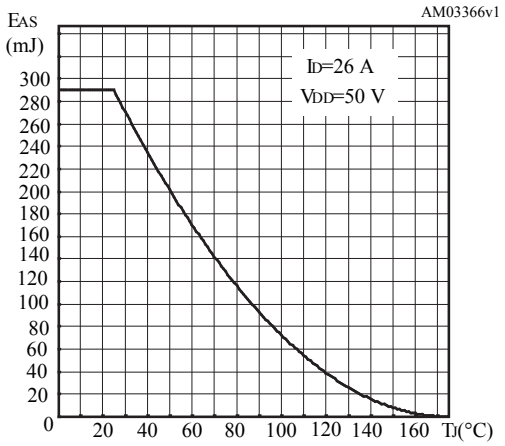


Figure 11. Normalized gate threshold vs temperature

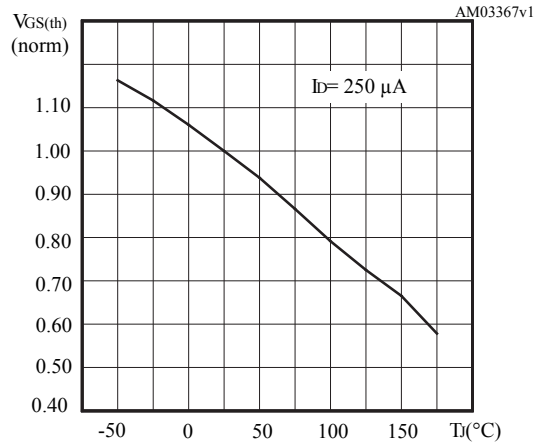


Figure 12. Normalized on-resistance vs temperature

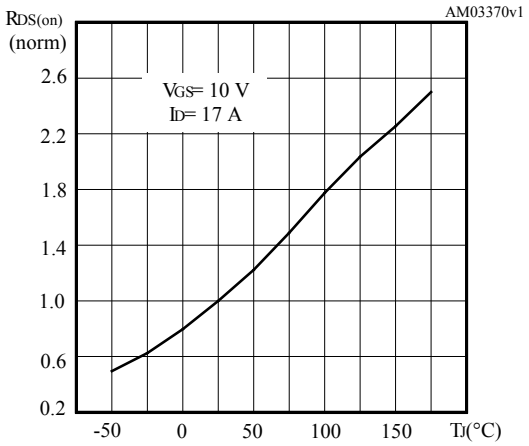


Figure 13. Typical reverse diode forward characteristics

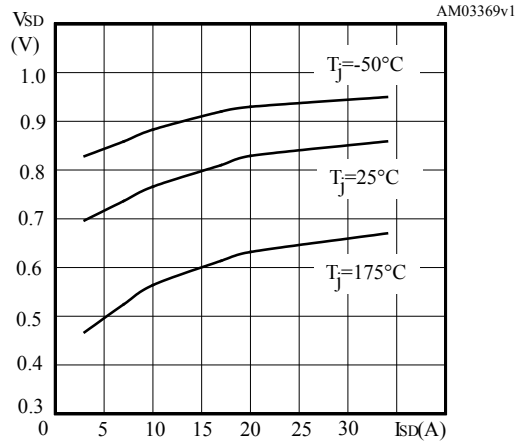
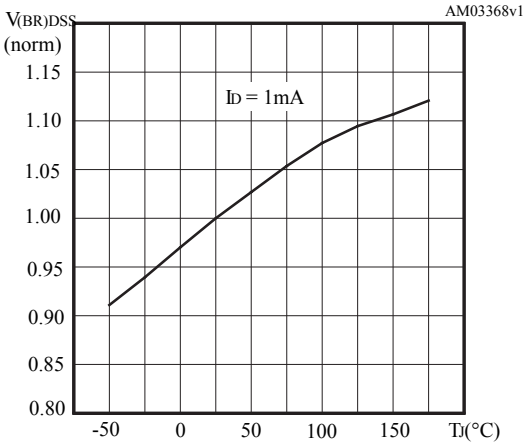
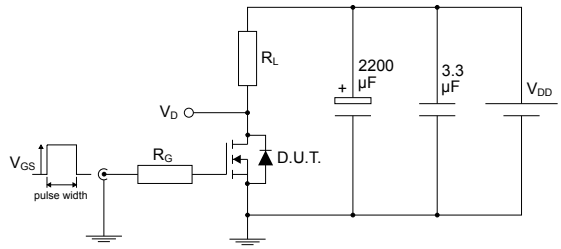


Figure 14. Normalized breakdown voltage vs temperature



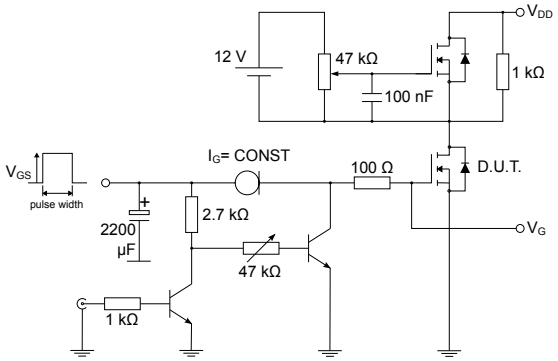
3 Test circuits

Figure 15. Test circuit for resistive load switching times



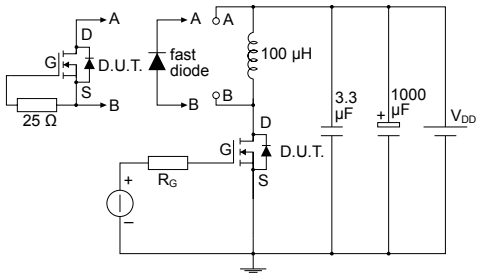
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Figure 16. Test circuit for gate charge behavior



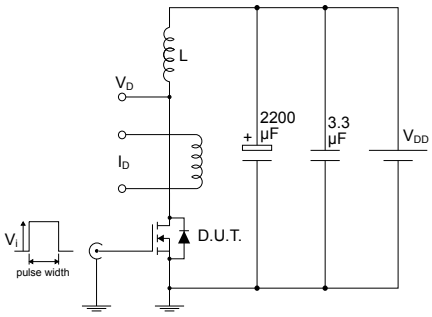
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Figure 17. Test circuit for inductive load switching and diode recovery times



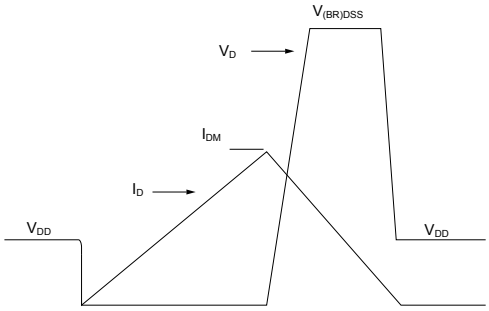
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Figure 18. Unclamped inductive load test circuit



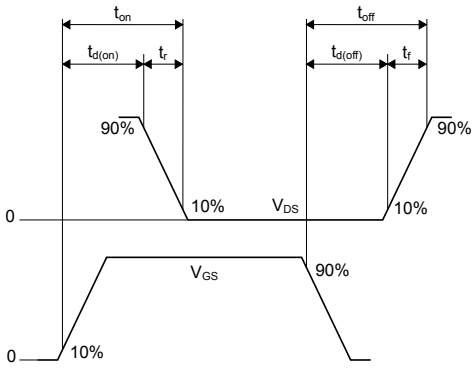
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Figure 19. Unclamped inductive waveform



AM01472v1

Figure 20. Switching time waveform



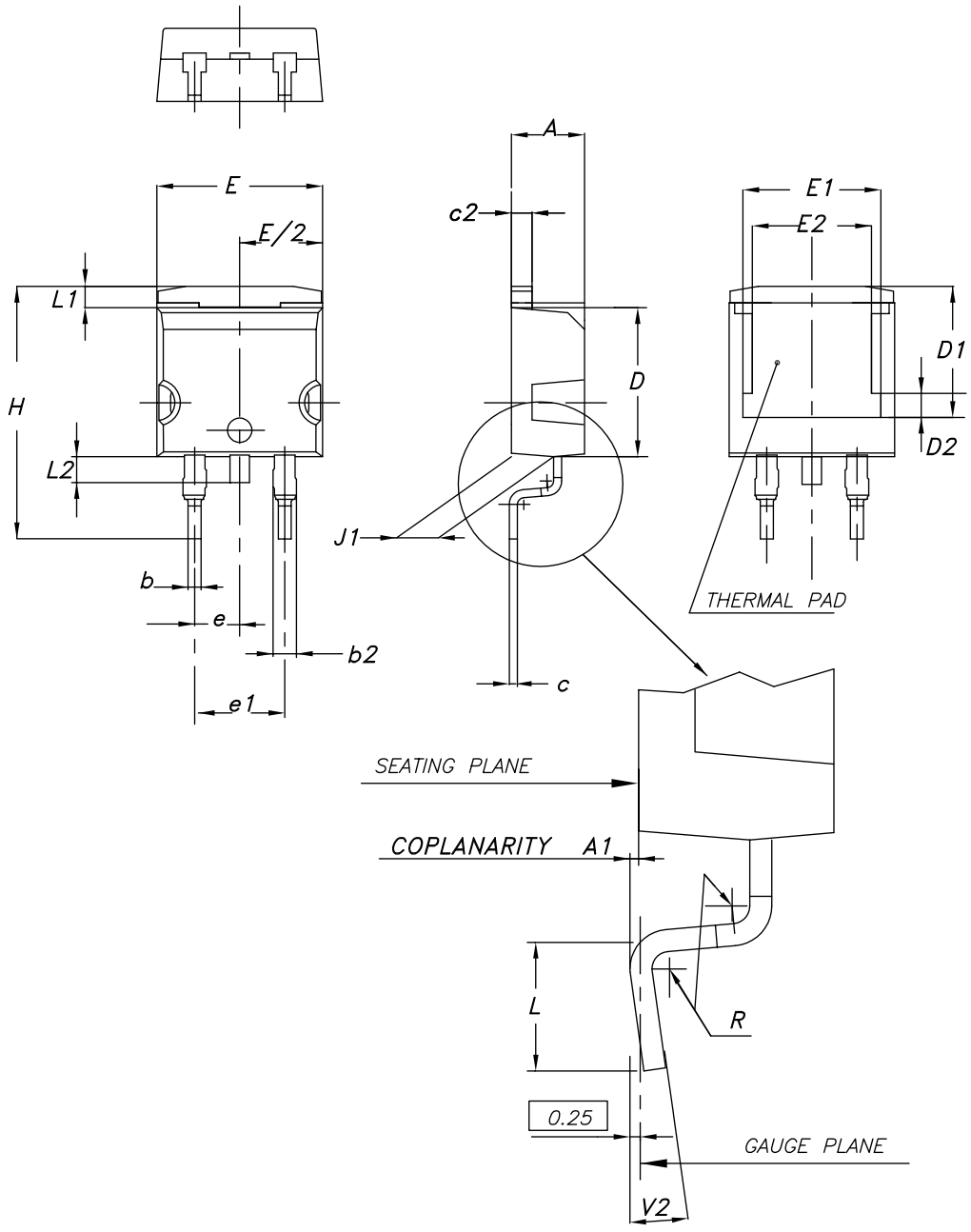
AM01473v1

4 Package information

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 A2 package information

Figure 21. **D²PAK (TO-263) type A2 package outline**

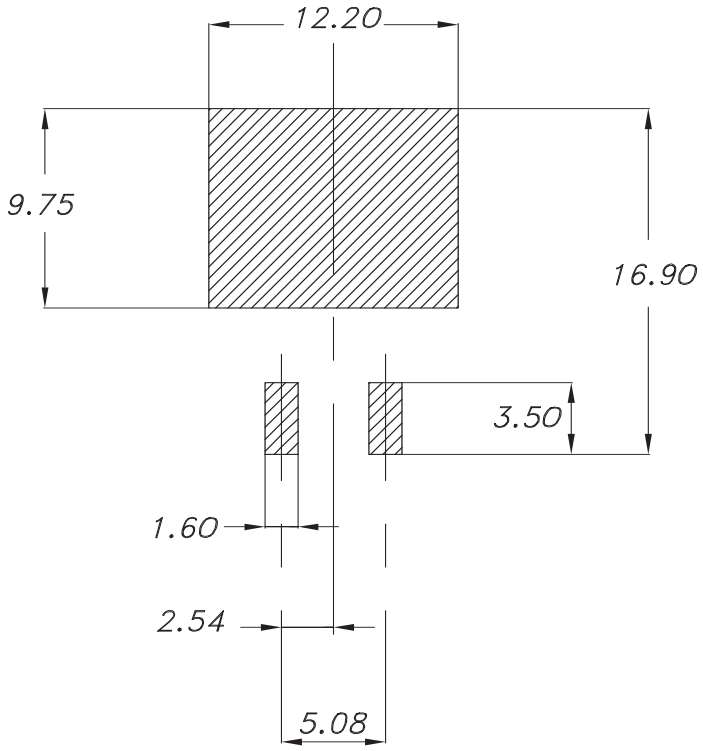


0079457_A2_27

Table 8. **D²PAK (TO-263) type A2 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	8.70	8.90	9.10
E2	7.30	7.50	7.70
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 22. D²PAK (TO-263) recommended footprint (dimensions are in mm)



4.2 TO-220 type A package information

Figure 23. **TO-220 type A package outline**

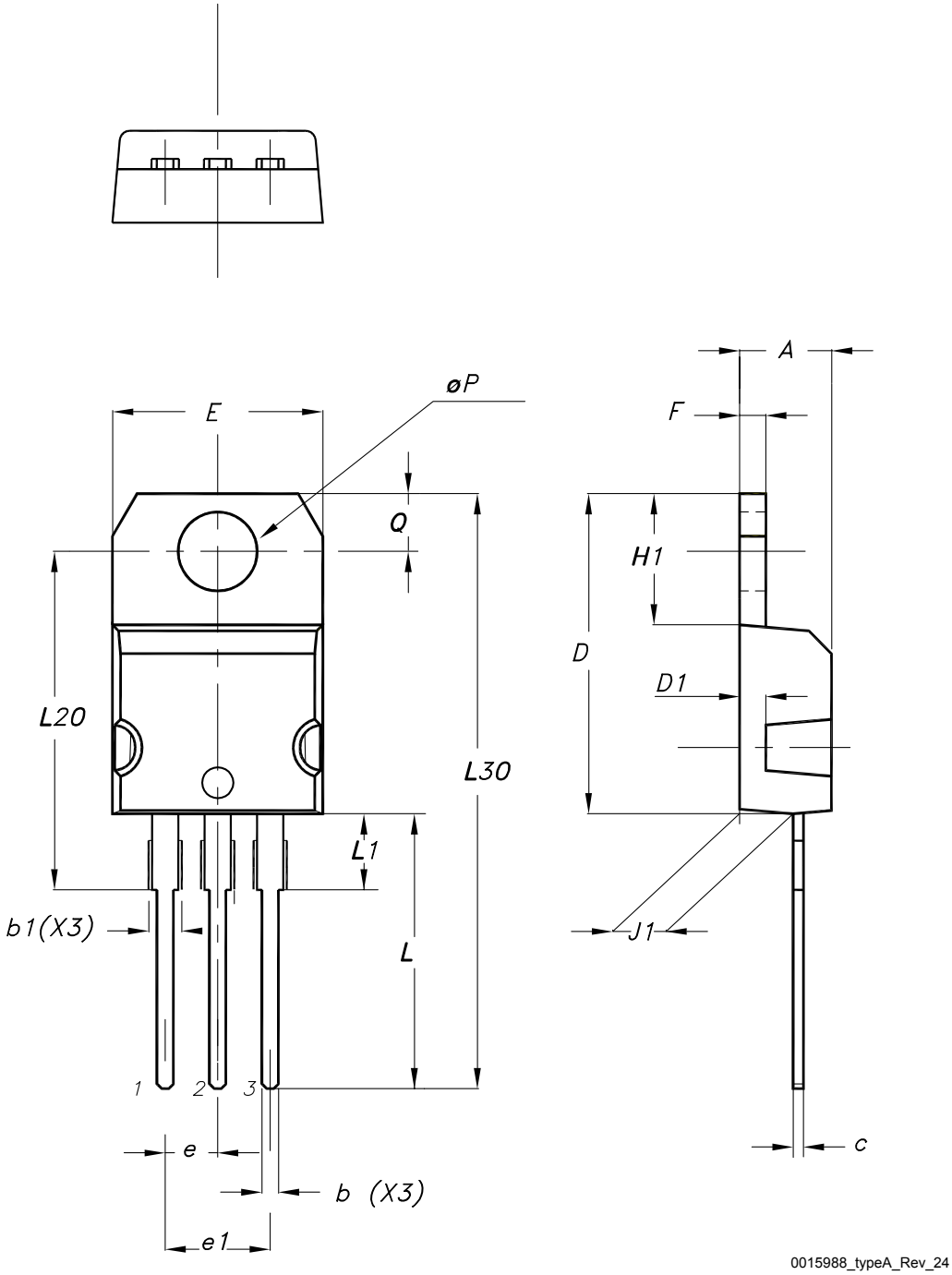
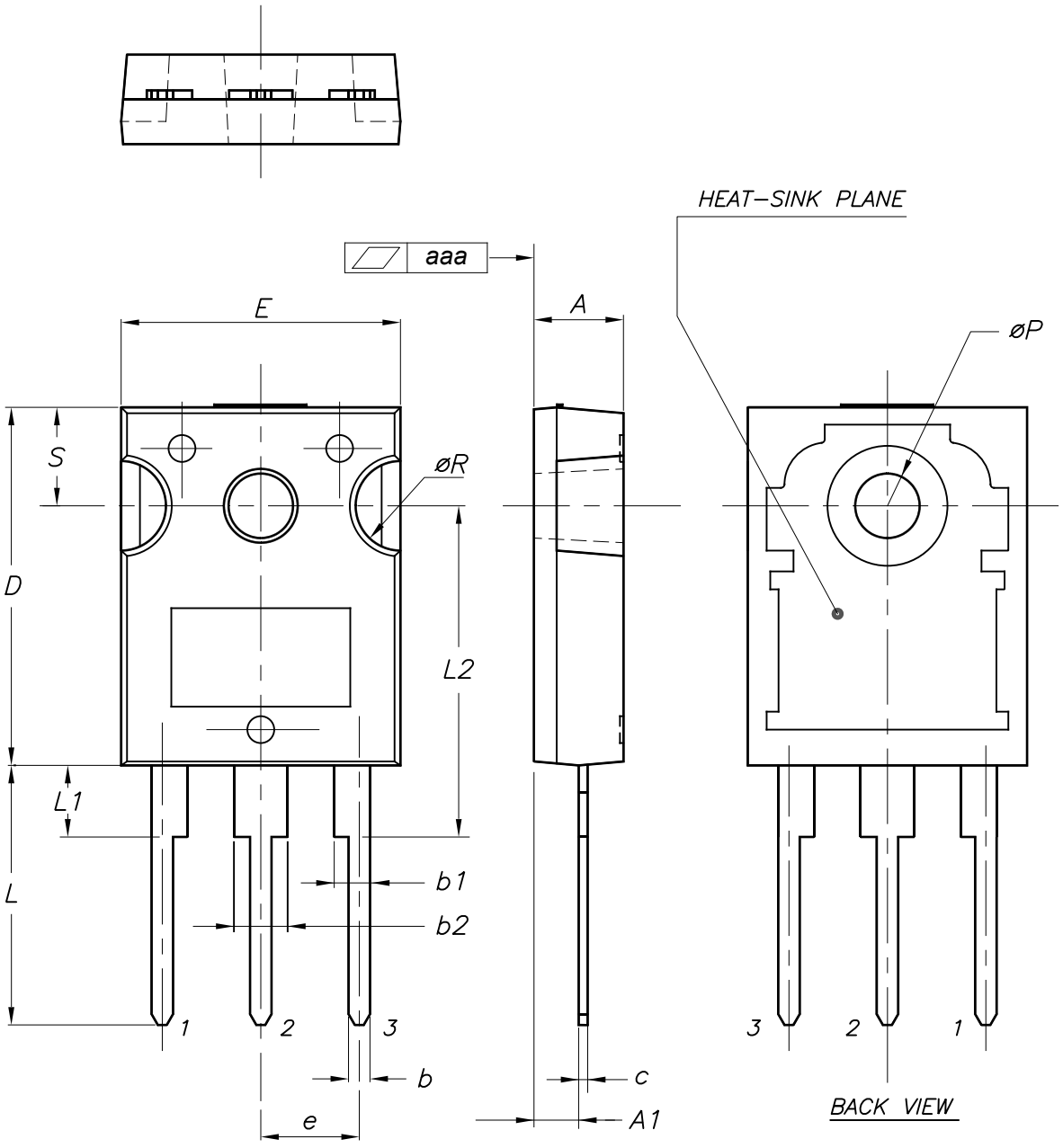


Table 9. **TO-220 type A package mechanical data**

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

4.3 TO-247 package information

Figure 24. **TO-247 package outline**



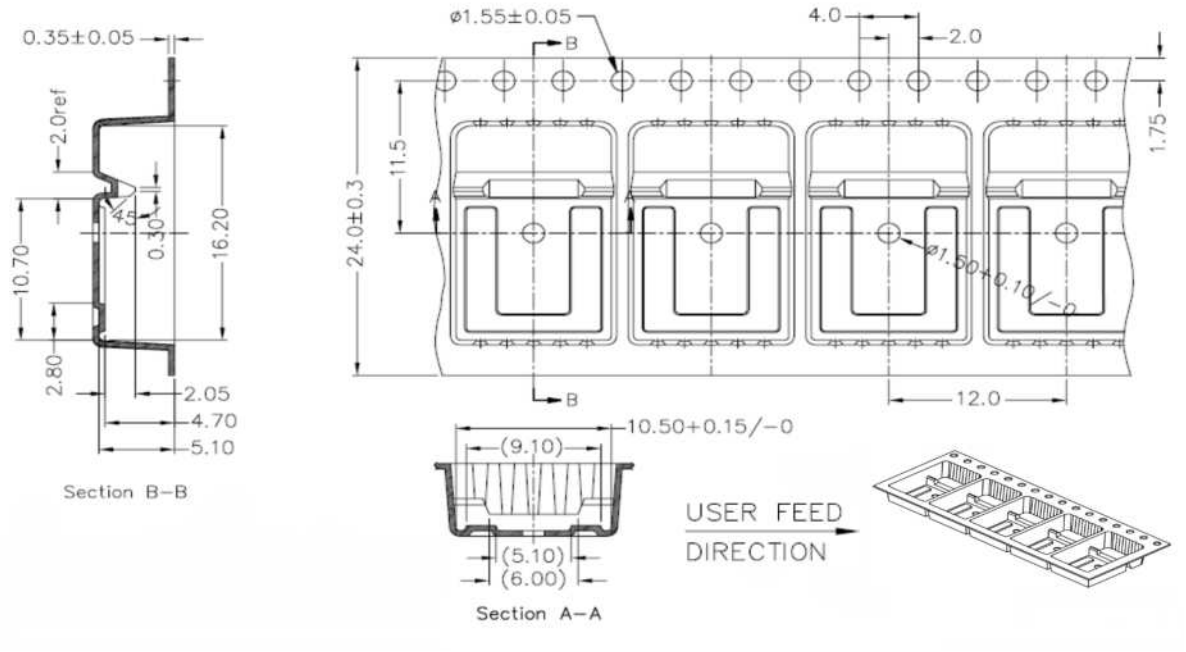
0075325_10

Table 10. **TO-247 package mechanical data**

Dim.	mm		
	Min.	Typ.	Max.
A	4.85		5.15
A1	2.20		2.60
b	1.0		1.40
b1	2.0		2.40
b2	3.0		3.40
c	0.40		0.80
D	19.85		20.15
E	15.45		15.75
e	5.30	5.45	5.60
L	14.20		14.80
L1	3.70		4.30
L2		18.50	
ØP	3.55		3.65
ØR	4.50		5.50
S	5.30	5.50	5.70
aaa		0.04	0.10

4.4 D²PAK packing information

Figure 25. D²PAK tape drawing (dimensions are in mm)



DM01095771_2

5 Ordering information

Table 11. **Order codes**

Order codes	Marking	Package	Packing
STB46NF30	46NF30	D²PAK	Tape and reel
STP46NF30		TO-220	Tube
STW46NF30		TO-247	

Revision history

Table 12. **Document revision history**

Date	Revision	Changes
28-Sep-2012	1	First release.
24-Aug-2016	2	Modified: *Table 7: "Source-drain diode"* Minor text changes
17-Oct-2025	3	Updated title and Features on cover page. Updated Section 4: Package information. Minor text changes.

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