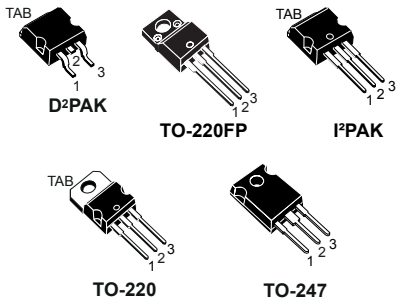
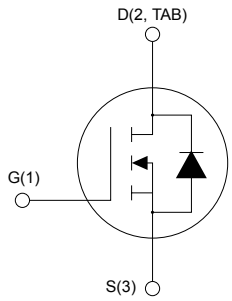
STB11NM80T4, STF11NM80, STI11NM80
STP11NM80, STW11NM80

Datasheet

N-channel 800 V, 380 mΩ typ., 11 A MDmesh Power MOSFETs in D²PAK, TO-220FP, I²PAK, TO-220 and TO-247 packages





Features

Order code	V_{DS}	$R_{DS(on)}$ max.	I_D
STB11NM80T4	800 V	400 mΩ	11 A
STF11NM80			
STI11NM80			
STP11NM80			
STW11NM80			

- High dv/dt and avalanche capabilities
- Low input capacitance and gate charge
- Low gate input resistance
- 100% avalanche tested

Applications

- Switching applications

Description

These N-channel Power MOSFETs are developed using STMicroelectronics' revolutionary MDmesh technology, which associates the multiple drain process with the company's PowerMESH horizontal layout. These devices offer extremely low on-resistance, high dv/dt and excellent avalanche characteristics. Utilizing ST's proprietary strip technique, these Power MOSFETs boast an overall dynamic performance which is superior to similar products on the market.

STPOWER

Product status links
STB11NM80T4
STF11NM80
STI11NM80
STP11NM80
STW11NM80

1 Electrical ratings

Table 1. Absolute maximum ratings

Symbol	Parameter	Value		Unit
		D^2PAK, I^2PAK, TO-220 TO-247	TO-220FP	
V_{DS}	Drain-source voltage	800		V
V_{GS}	Gate-source voltage	±30		V
I_D	Drain current (continuous) at T_C = 25 °C	11	11(1)	A
	Drain current (continuous) at T_C = 100 °C	8	8(1)	
I_{DM} (2)	Drain current (pulsed)	44	44(1)	A
P_{TOT}	Total power dissipation at T_C = 25 °C	150	35	W
dv/dt(3)	Peak diode recovery voltage slope	30		V/ns
V_{ISO}	Insulation withstand voltage (RMS) from all three leads to external heat sink (t = 1 s, T_C = 25 °C)		2.5	kV
T_{stg}	Storage temperature range	-65 to 150		°C
T_J	Operation junction temperature range			°C

1. *Limited by maximum junction temperature.*
2. *Pulse width is limited by safe operating area.*
3. *V_{DD} = 640 V, I_{SD} = 11 A.*

Table 2. Thermal data

Symbol	Parameter	Value					Unit
		D^2PAK	TO-220FP	I^2PAK	TO-220	TO-247	
R_{thJC}	Thermal resistance, junction-to-case	0.83	3.6	0.83			°C/W
R_{thJA}	Thermal resistance, junction-to-ambient	30(1)	62.5			50	°C/W

1. *When mounted on a standard 1 inch2 area of FR-4 PCB with 2-oz copper.*

Table 3. Avalanche characteristics

Symbol	Parameter	Value	Unit
I_{AR}	Avalanche current, repetitive or non-repetitive (pulse width limited by T_J max.)	2.5	A
E_{AS}	Single pulse avalanche energy (starting T_J = 25 °C, I_D = I_{AR}, V_{DD} = 50 V)	400	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 = 250 µA, V_{GS} = 0 V	800			V
I_{DSS}	Zero gate voltage drain current	V_{GS} = 0 V, V_{DS} = 800 V			10	µA
		V_{GS} = 0 V, V_{DS} = 800 V, T_C = 125 °C(1)			100	
I_{GSS}	Gate body leakage current	V_{DS} = 0 V, V_{GS} = ±30 V			±100	nA
$V_{GS(th)}$	Gate threshold voltage	V_{DS} = V_{GS}, I_D = 250 µA	3	4	5	V
$R_{DS(on)}$	Static drain-source on-resistance	V_{GS} = 10 V, I_D = 5.5 A		380	400	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	-	1630	-	pF
C_{oss}	Output capacitance		-	750	-	pF
C_{rss}	Reverse transfer capacitance		-	30	-	pF
Q_g	Total gate charge	V_{DD} = 640 V, I_D = 11 A, V_{GS} = 0 to 10 V (see the Figure 16. Test circuit for gate charge behavior)	-	50	-	nC
Q_{gs}	Gate-source charge		-	12	-	nC
Q_{gd}	Gate-drain charge		-	21	-	nC
R_g	Gate input resistance	f = 1 MHz, open drain	-	2.7	-	Ω

Table 6. Switching times

Symbol	Parameter	Test condition	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	V_{DD} = 400 V, I_D = 5.5 A, R_G = 4.7 Ω, V_{GS} = 10 V (see the Figure 15. Test circuit for resistive load switching times and Figure 20. Switching time waveform)	-	22	-	ns
t_r	Rise time		-	17	-	ns
$t_{d(off)}$	Turn-off delay time		-	46	-	ns
t_f	Fall time		-	15	-	ns

Table 7. Source-drain diode

Symbol	Parameter	Test condition	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain current		-		11	A
I_{SDM}(1)	Source-drain current (pulsed)		-		44	A
V_{SD}(2)	Forward on voltage	I_{SD} = 11 A, V_{GS} = 0 V	-	0.86		V
t_{rr}	Reverse recovery time	I_{SD} = 11 A, di/dt = 100 A/µs,	-	612		ns
Q_{rr}	Reverse recovery charge	V_{DD} = 50 V	-	7.22		µC
I_{RRM}	Reverse recovery current	(see the Figure 17. Test circuit for inductive load switching and diode recovery times)	-	23.6		A
t_{rr}	Reverse recovery time	I_{SD} = 20 A, di/dt = 100 A/µs,	-	970		ns
Q_{rr}	Reverse recovery charge	V_{DD} = 50 V, T_J = 150 °C	-	11.25		µC
I_{RRM}	Reverse recovery current	(see the Figure 17. Test circuit for inductive load switching and diode recovery times)	-	23.2		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, I²PAK, TO-220 and TO-247

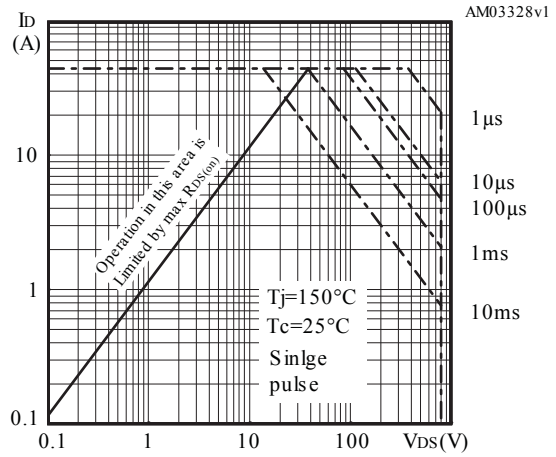


Figure 2. Normalized transient thermal impedance for D²PAK, I²PAK, TO-220 and TO-247

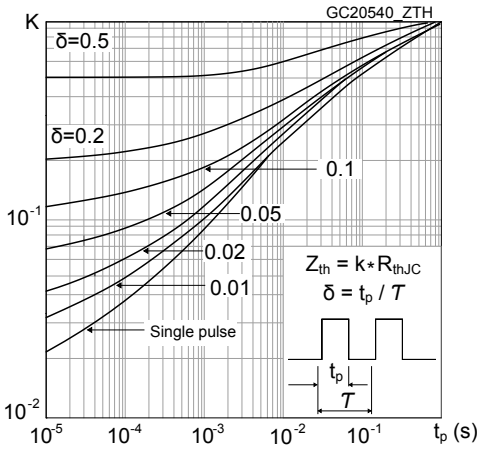


Figure 3. Safe operating area for TO-220FP

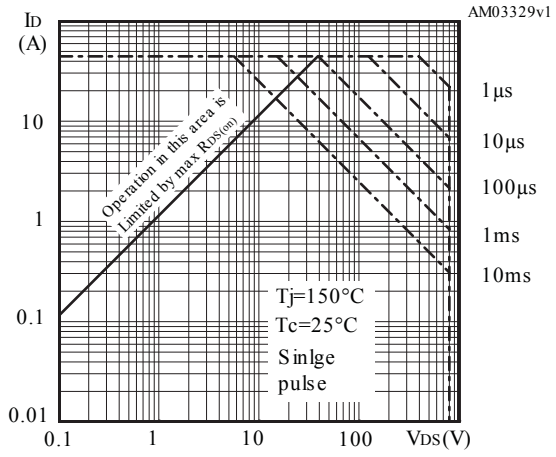


Figure 4. Normalized transient thermal impedance for TO-220FP

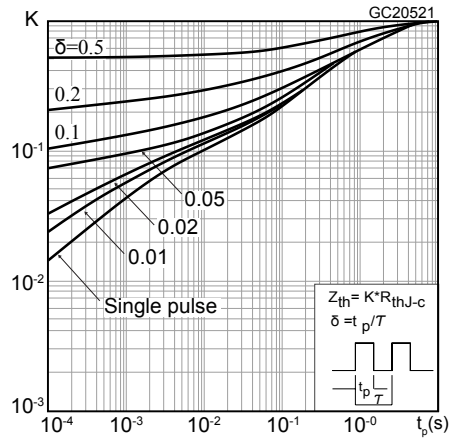


Figure 5. Typical output characteristics at T_J = 25 °C

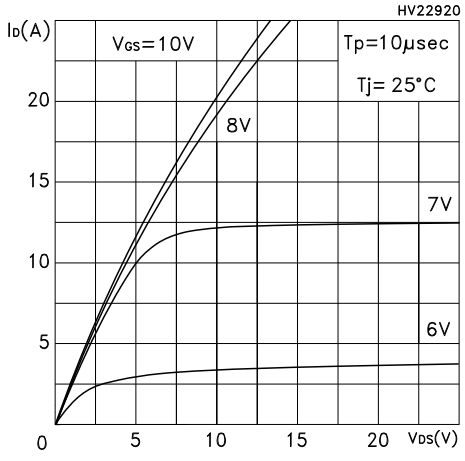


Figure 6. Typical output characteristics at T_J = 150 °C

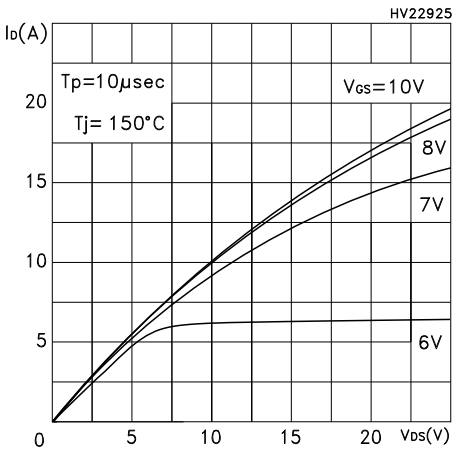


Figure 7. Typical transfer characteristics

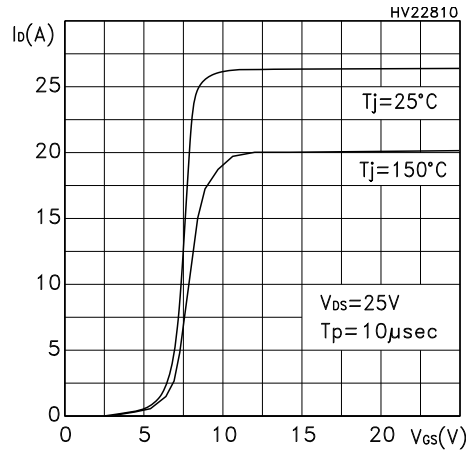


Figure 8. Typical gate charge characteristics

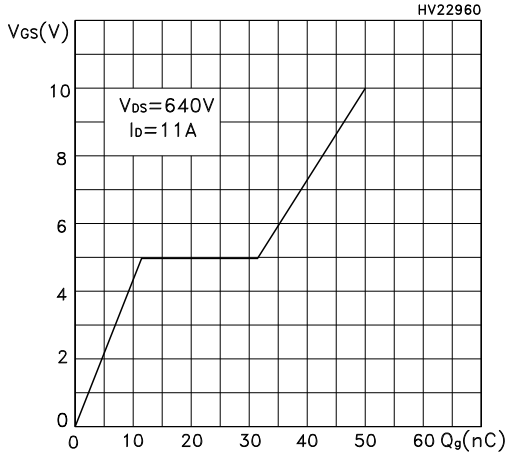


Figure 9. Typical drain-source on-resistance

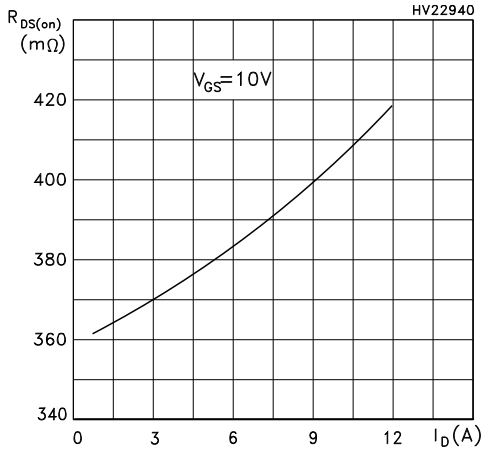


Figure 10. Typical capacitance characteristics

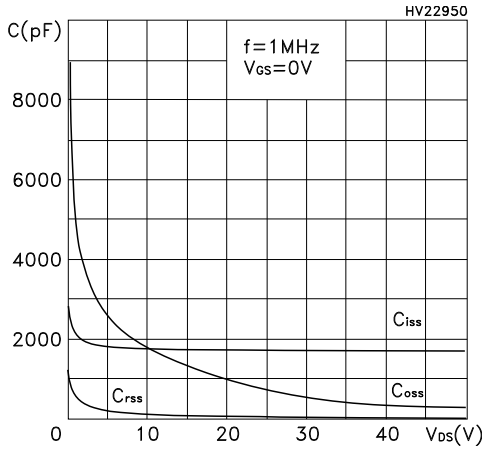


Figure 11. Normalized gate threshold vs temperature

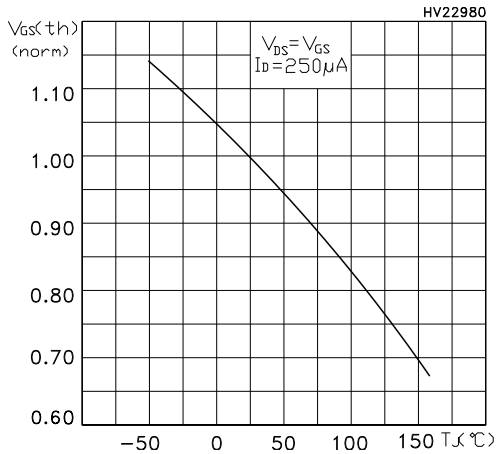


Figure 12. Normalized on-resistance vs temperature

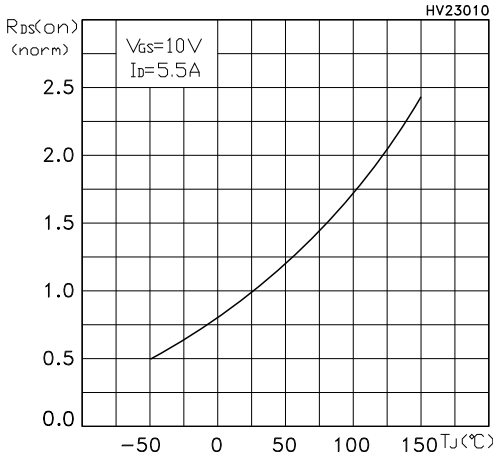


Figure 13. Normalized breakdown voltage vs temperature

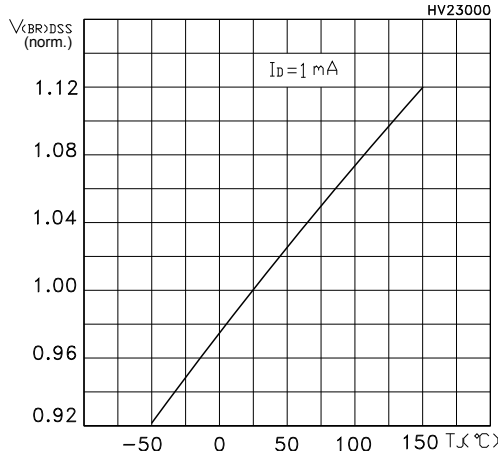
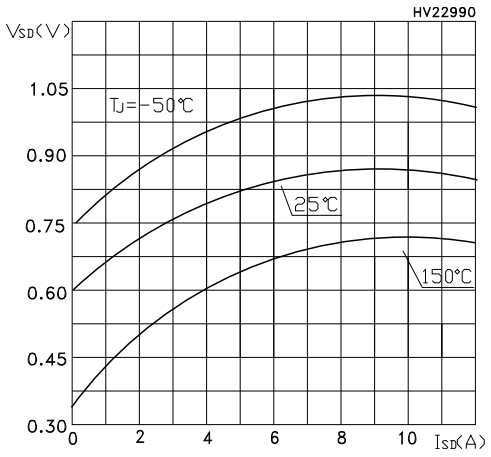
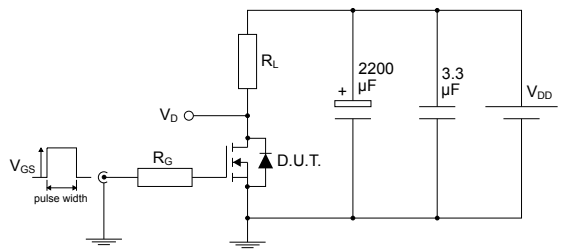


Figure 14. Typical reverse diode forward characteristics



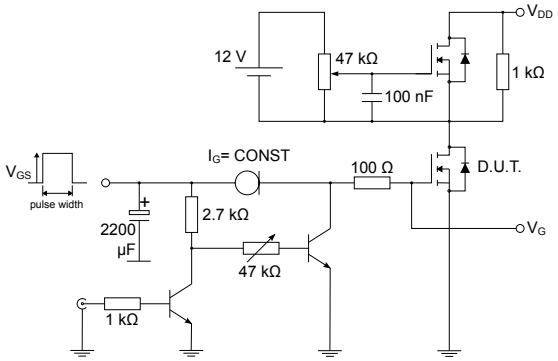
3 Test circuits

Figure 15. Test circuit for resistive load switching times



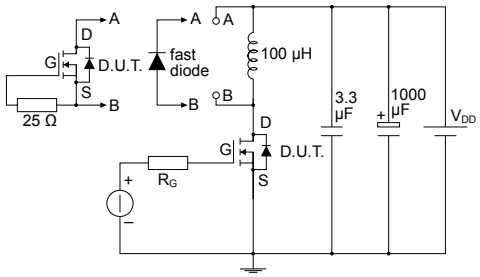
AM01468v1

Figure 16. Test circuit for gate charge behavior



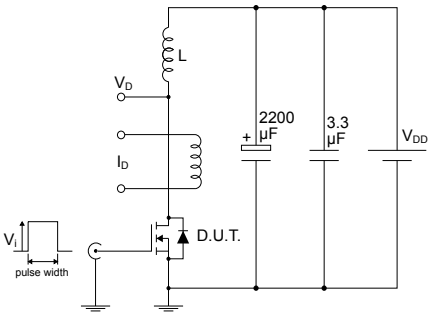
AM01469v1

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



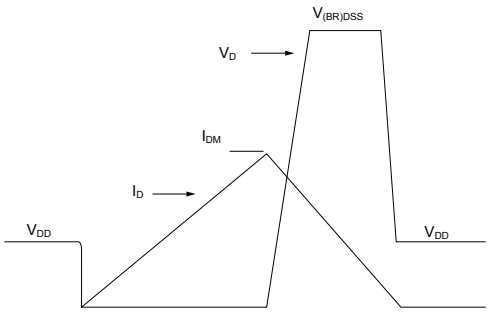
AM01470v1

Figure 18. Unclamped inductive load test circuit



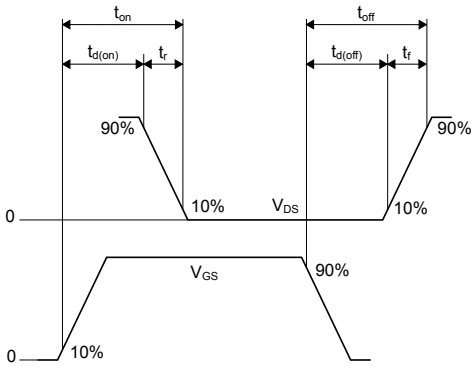
AM01471v1

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 A package information

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

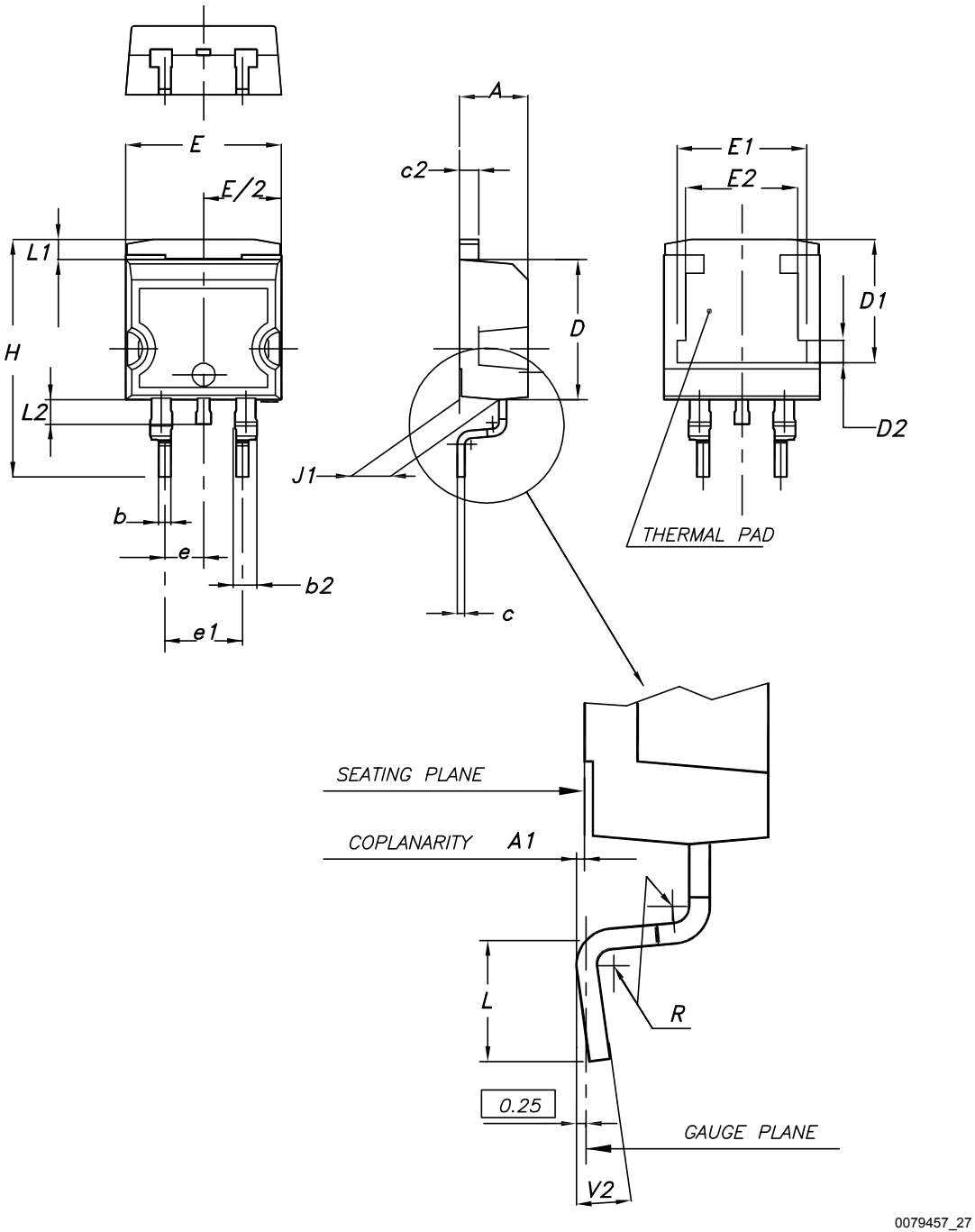
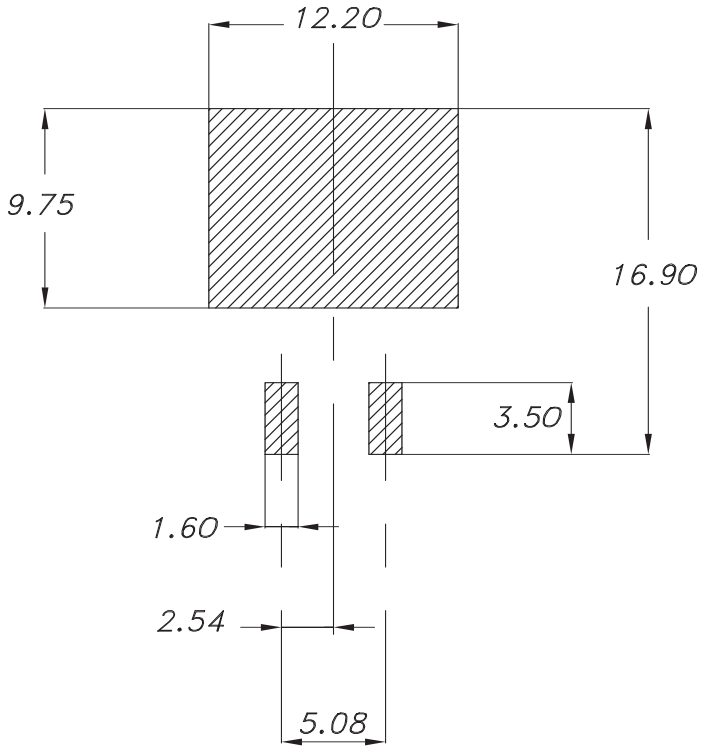


Table 8. D²PAK (TO-263) type A package mechanical data

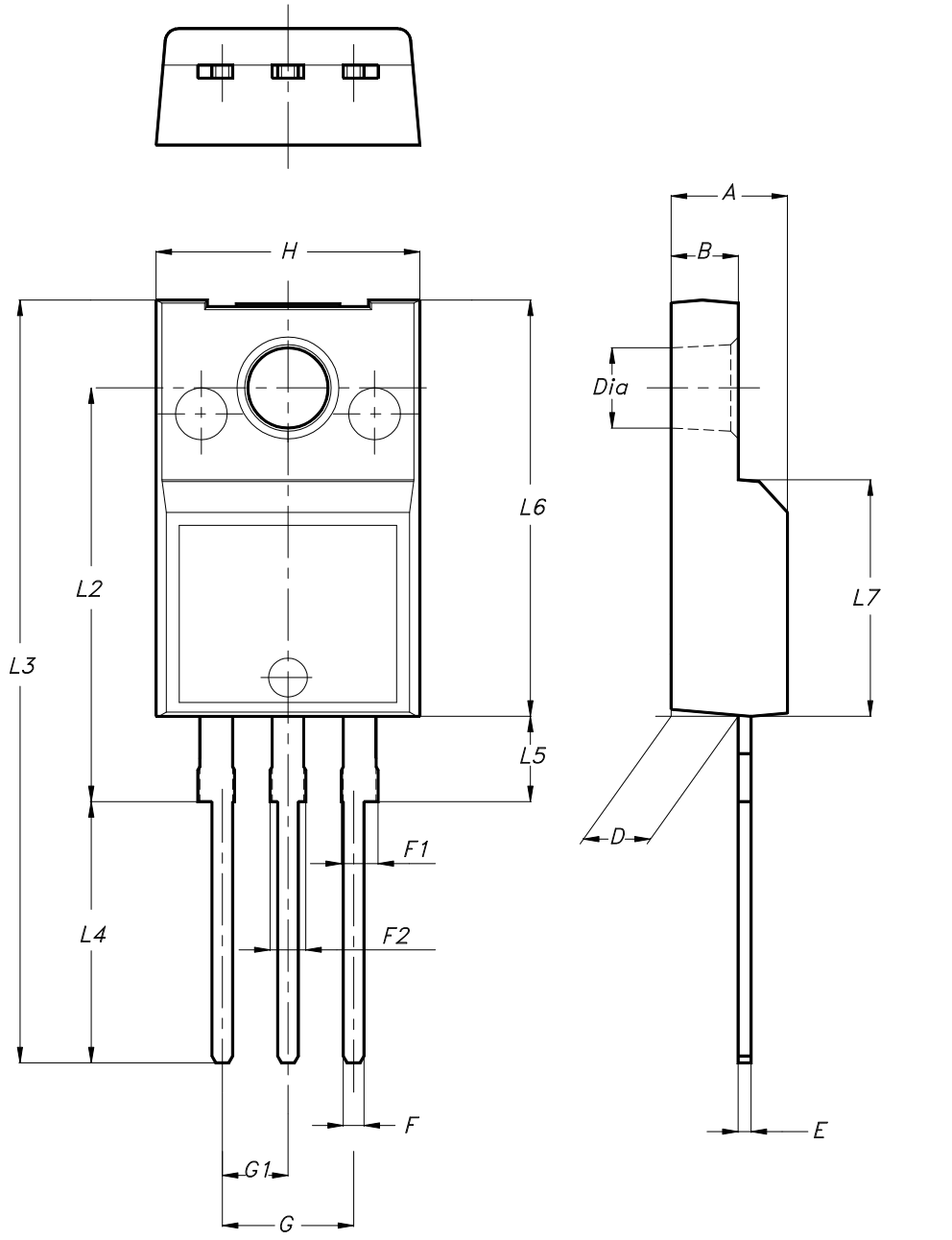
Dim.	mm		
	Min.	Typ.	Max.
A	4.40		4.60
A1	0.03		0.23
b	0.70		0.93
b2	1.14		1.70
c	0.45		0.60
c2	1.23		1.36
D	8.95		9.35
D1	7.50	7.75	8.00
D2	1.10	1.30	1.50
E	10.00		10.40
E1	8.30	8.50	8.70
E2	6.85	7.05	7.25
e		2.54	
e1	4.88		5.28
H	15.00		15.85
J1	2.49		2.69
L	2.29		2.79
L1	1.27		1.40
L2	1.30		1.75
R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

Figure 22. D²PAK (TO-263) recommended footprint (dimensions are in mm)



4.2 TO-220FP type B package information

Figure 23. **TO-220FP type B package outline**



7012510_B_rev.14

Table 9. **TO-220FP type B 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

4.3 I²PAK package information

Figure 24. I²PAK package outline

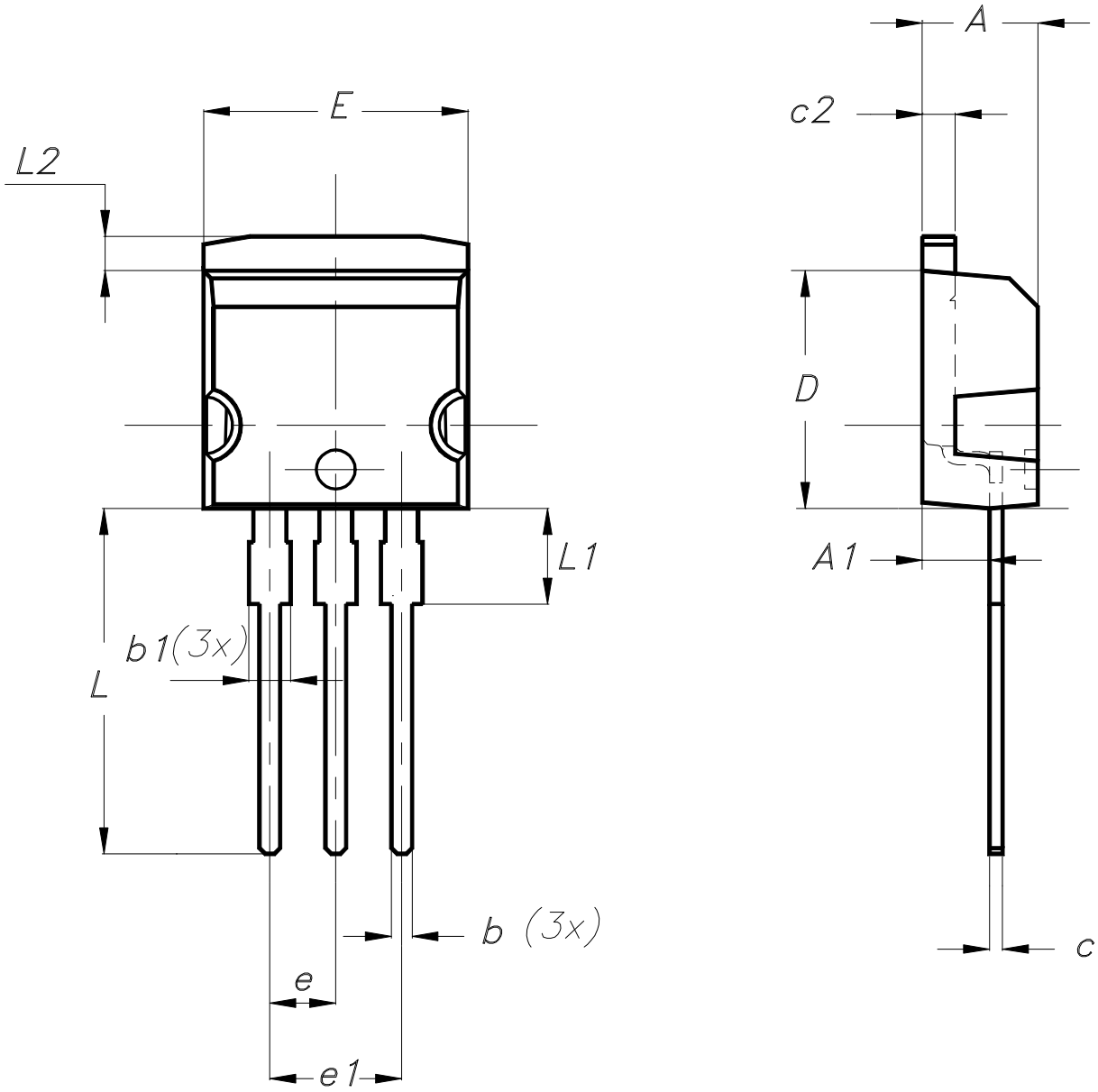


Table 10. I²PAK package mechanical data

Dim.	mm	
	Min.	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

4.4 TO-220 type A package information

Figure 25. **TO-220 type A package outline**

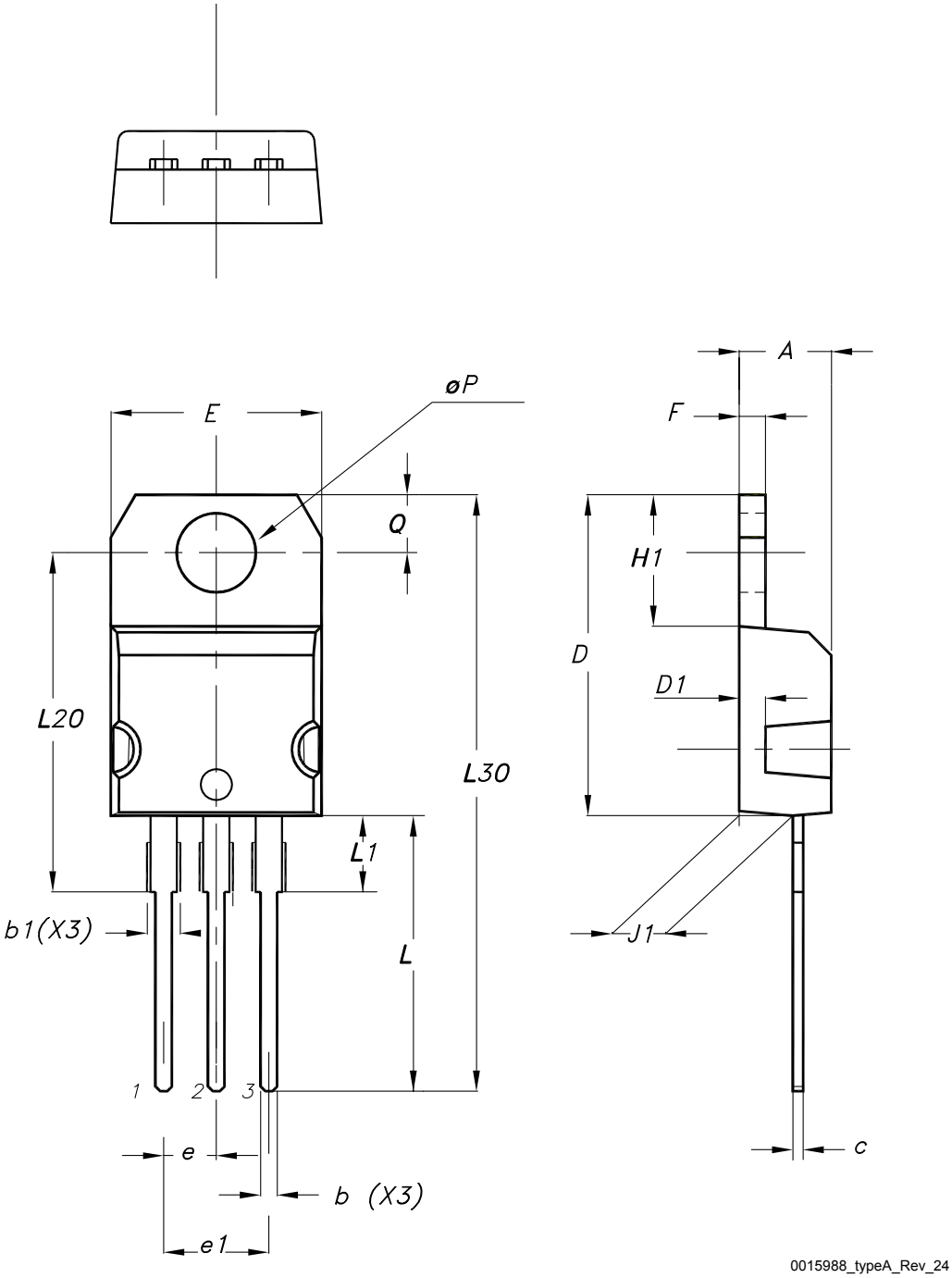
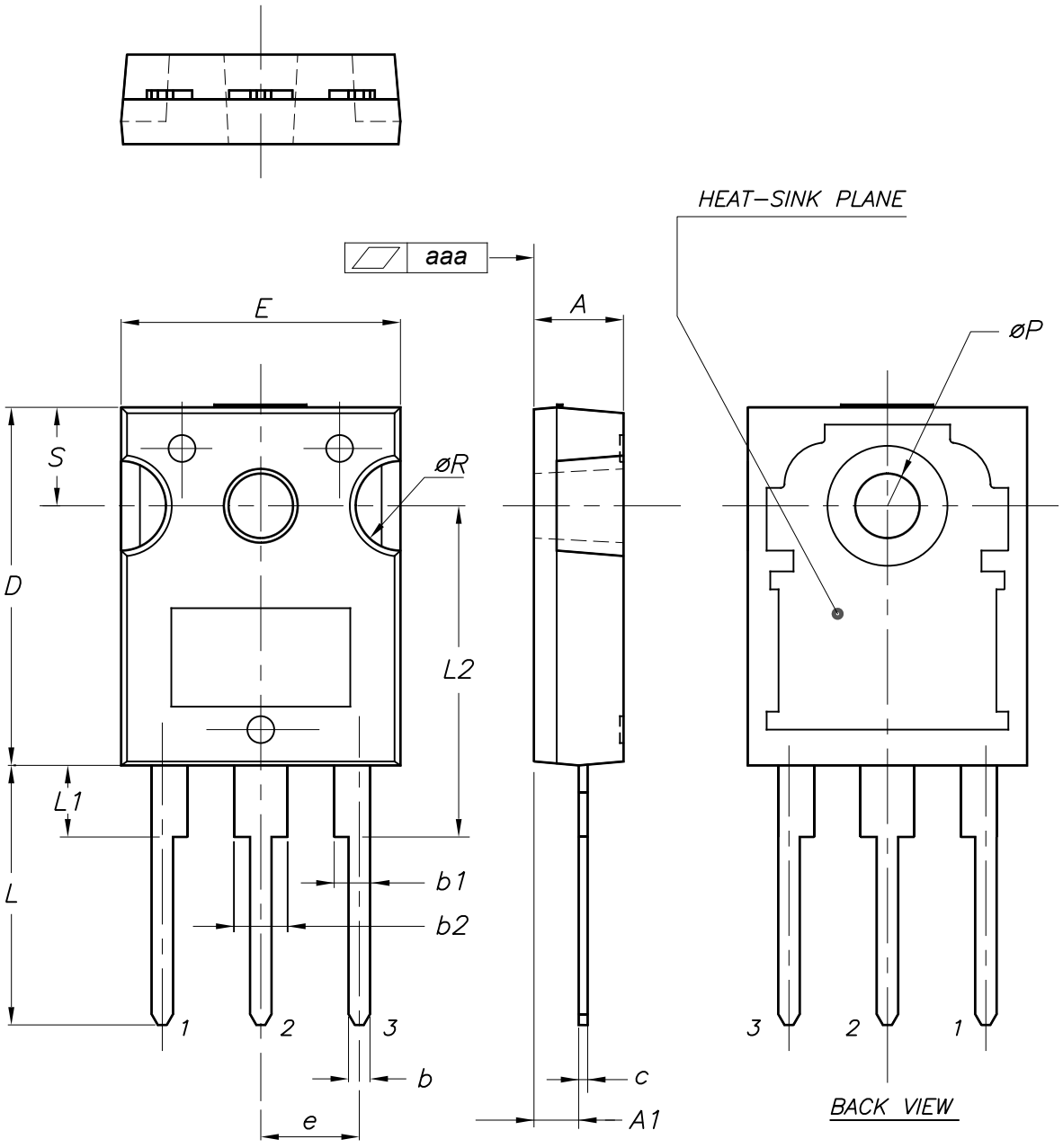


Table 11. **TO-220 type A package mechanical data**

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

4.5 TO-247 package information

Figure 26. **TO-247 package outline**



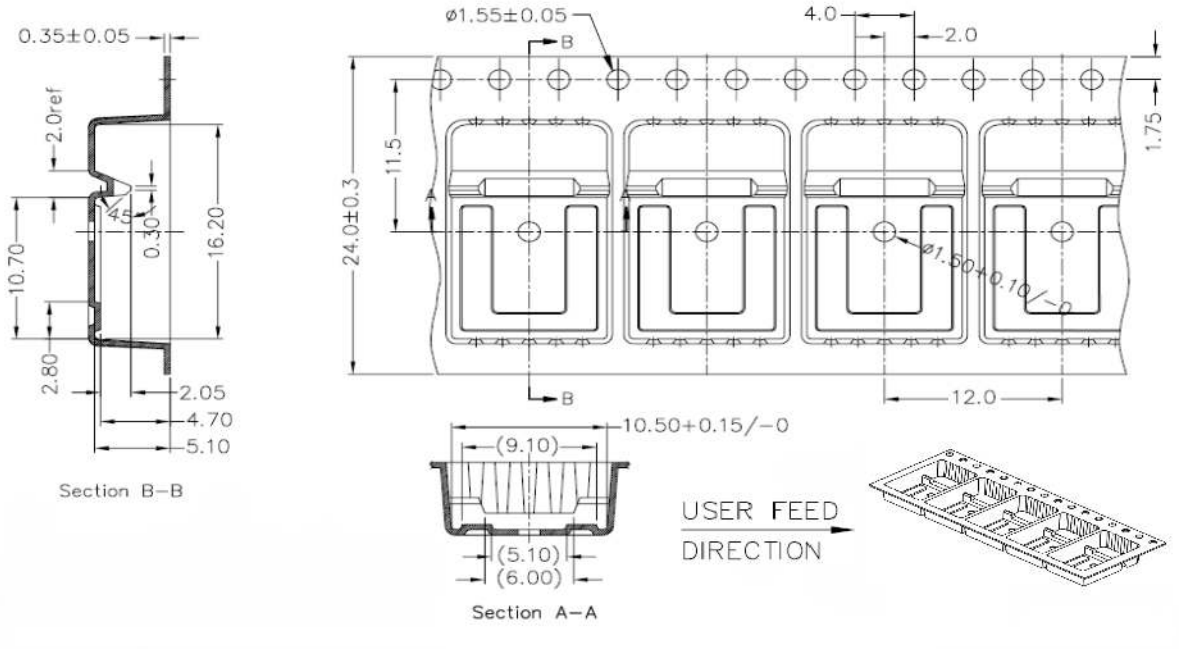
0075325_10

Table 12. **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

4.6 D²PAK packing information

Figure 27. **D²PAK tape drawing (dimensions are in mm)**



DM01095771_2

5 Ordering information

Table 13. **Order codes**

Order codes	Marking	Package	Packing
STB11NM80T4	B11NM80	D²PAK	Tape and reel
STF11NM80	F11NM80	TO-220FP	Tube
STI11NM80	I11NM80	I²PAK	
STP11NM80	P11NM80	TO-220	
STW11NM80	W11NM80	TO-247	

Revision history

Table 14. **Document revision history**

Date	Revision	Changes
30-Sep-2004	4	Preliminary version
26-Nov-2005	5	Complete version
07-Apr-2006	6	Modified value on *Figure 8*
15-May-2006	7	New dv/dt value on *Table 5*
20-Jul-2006	8	The document has been reformatted
20-Dec-2007	9	Updated I_D value on *Table 2: Absolute maximum ratings*
24-Mar-2010	10	Inserted dv/dt value in *Table 2: Absolute maximum ratings*
12-Sep-2011	11	Added new package and mechanical data : I²PAK Minor text changes
17-Sep-2025	12	Updated Section 4: Package information. Minor text changes.

Contents