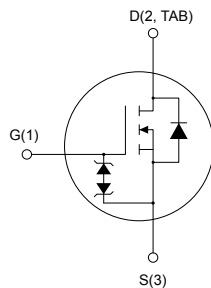
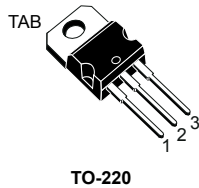


N-channel 800 V, 197 mΩ typ., 16 A MDmesh K6 Power MOSFET in a TO-220 package



AM01476v1_tab



Features

Order code	V _{DS}	R _{DS(on)} max.	I _D
STP80N240K6	800 V	220 mΩ	16 A

- Worldwide best R_{DS(on)} x area
- Worldwide best FOM (figure of merit)
- Ultra low gate charge
- 100% avalanche tested
- Zener-protected

Applications

- Recommended for flyback topology, based applications such as LED lighting, chargers and adapters. Provide more power density reducing both BOM cost and size of the board.

Description

This very high voltage N-channel Power MOSFET is designed using the ultimate MDmesh K6 technology based on 20 years STMicroelectronics experience on super junction technology. The result is the best-in-class on-resistance per area and gate charge for applications requiring superior power density and high efficiency.

Product status link

[STP80N240K6](#)

Product summary

Order code	STP80N240K6
Marking	80N240K6
Package	TO-220
Packing	Tube

1 Electrical ratings

Table 1. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{GS}	Gate-source voltage	± 30	V
I_D	Drain current (continuous) at $T_C = 25\text{ }^{\circ}\text{C}$	16	A
I_D	Drain current (continuous) at $T_C = 100\text{ }^{\circ}\text{C}$	10	A
$I_{DM}^{(1)}$	Drain current (pulsed)	35	A
P_{TOT}	Total power dissipation at $T_C = 25\text{ }^{\circ}\text{C}$	140	W
$dv/dt^{(2)}$	Peak diode recovery voltage slope	5	V/ns
$dv/dt^{(2)}$	Peak diode recovery current slope	100	A/ μs
$dv/dt^{(3)}$	MOSFET dv/dt ruggedness	120	V/ns
T_{stg}	Storage temperature range	-55 to 150	$^{\circ}\text{C}$
T_J	Operating junction temperature range		

1. Pulse width limited by safe operating area.

2. $I_{SD} \leq 4\text{ A}$; $V_{DS}(\text{peak}) = 400\text{ V}$

3. $V_{DS} \leq 640\text{ V}$

Table 2. Thermal data

Symbol	Parameter	Value	Unit
R_{thJC}	Thermal resistance, junction-to-case	0.89	$^{\circ}\text{C/W}$
R_{thJA}	Thermal resistance, junction-to-ambient	62.5	$^{\circ}\text{C/W}$

Table 3. Avalanche characteristics

Symbol	Parameter	Value	Unit
I_{AR}	Avalanche current, repetitive or not repetitive (pulse width limited by T_J max.)	3.3	A
E_{AS}	Single pulse avalanche energy (starting $T_J = 25\text{ }^{\circ}\text{C}$, $I_D = I_{AR}$, $V_{DD} = 50\text{ V}$)	200	mJ

2 Electrical characteristics

$T_C = 25\text{ }^{\circ}\text{C}$ unless otherwise specified.

Table 4. On/off-state

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	$V_{GS} = 0\text{ V}$, $I_D = 1\text{ mA}$	800			V
I_{DSS}	Zero gate voltage drain current	$V_{GS} = 0\text{ V}$, $V_{DS} = 800\text{ V}$			1	μA
		$V_{GS} = 0\text{ V}$, $V_{DS} = 800\text{ V}$, $T_C = 125\text{ }^{\circ}\text{C}^{(1)}$			50	μA
I_{GSS}	Gate body leakage current	$V_{DS} = 0\text{ V}$, $V_{GS} = \pm 20\text{ V}$			± 1	μA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}$, $I_D = 100\text{ }\mu\text{A}$	3	3.5	4	V
$R_{DS(on)}$	Static drain-source on-resistance	$V_{GS} = 10\text{ V}$, $I_D = 7\text{ A}$		197	220	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	$V_{DS} = 100\text{ V}$, $f = 1\text{ MHz}$, $V_{GS} = 0\text{ V}$	-	1350	-	pF
C_{oss}	Output capacitance		-	22	-	pF
$C_{o(er)}^{(1)}$	Equivalent capacitance time related	$V_{DS} = 0\text{ to }640\text{ V}$, $V_{GS} = 0\text{ V}$	-	25	-	pF
$C_{o(tr)}^{(2)}$	Equivalent capacitance energy related		-	139	-	pF
R_g	Intrinsic gate resistance	$f = 1\text{ MHz}$, $I_D = 0\text{ A}$	-	1.8	-	Ω
Q_g	Total gate charge	$V_{DD} = 640\text{ V}$, $I_D = 7\text{ A}$, $V_{GS} = 0\text{ to }10\text{ V}$ (see Figure 19. Test circuit for gate charge behavior)	-	25.9	-	nC
Q_{gs}	Gate-source charge		-	6.9	-	nC
Q_{gd}	Gate-drain charge		-	8.4	-	nC

1. $C_{o(er)}$ is a constant capacitance value that gives the same stored energy as C_{oss} while V_{DS} is rising from 0 to 80% V_{DSS} .

2. $C_{o(tr)}$ is a constant capacitance value that gives the same stored energy as C_{oss} while V_{DS} is rising from 0 to 80% V_{DSS} .

Table 6. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{DD} = 400\text{ V}$, $I_D = 7\text{ A}$, $R_G = 4.7\text{ }\Omega$ $V_{GS} = 10\text{ V}$	-	16	-	ns
t_r	Rise time		-	5.3	-	ns
$t_{d(off)}$	Turn-off delay time	see (Figure 17. Test circuit for resistive load switching times and Figure 18. Switching time waveform)	-	47.8	-	ns
t_f	Fall time		-	12	-	ns

Table 7. Source-drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain current		-		14	A
$I_{SDM}^{(1)}$	Source-drain current (pulsed)		-		35	A
$V_{SD}^{(2)}$	Forward on voltage	$I_{SD} = 14\text{ A}$, $V_{GS} = 0\text{ V}$	-		1.5	V
t_{rr}	Reverse recovery time	$I_{SD} = 14\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$, $V_{DD} = 60\text{ V}$ (see Figure 20. Test circuit for inductive load switching and diode recovery times)	-	335		ns
Q_{rr}	Reverse recovery charge		-	5.4		μC
I_{RRM}	Reverse recovery current		-	27.5		A
t_{rr}	Reverse recovery time	$I_{SD} = 14\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$, $V_{DD} = 60\text{ V}$, $T_J = 150\text{ }^\circ\text{C}$ (see Figure 20. Test circuit for inductive load switching and diode recovery times)	-	430		ns
Q_{rr}	Reverse recovery charge		-	7.4		μC
I_{RRM}	Reverse recovery current		-	28		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

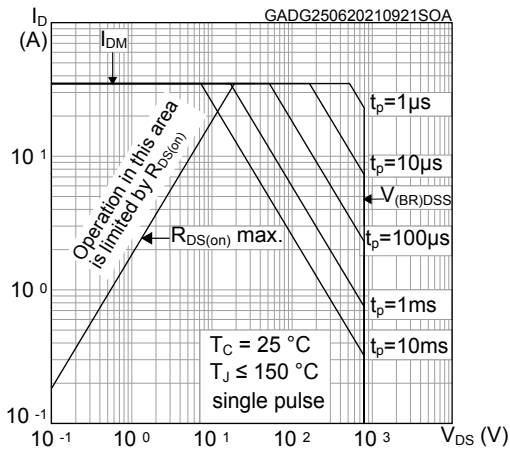


Figure 2. Maximum transient thermal impedance

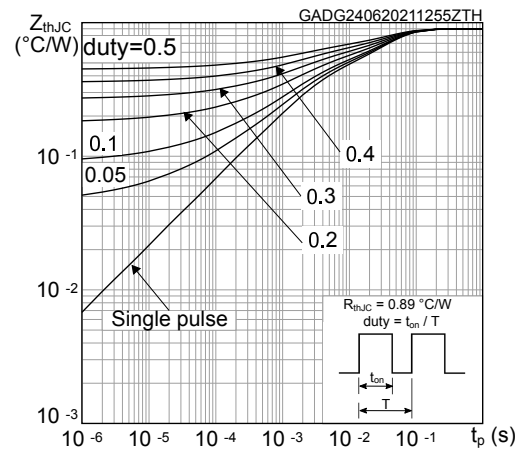


Figure 3. Typical output characteristics

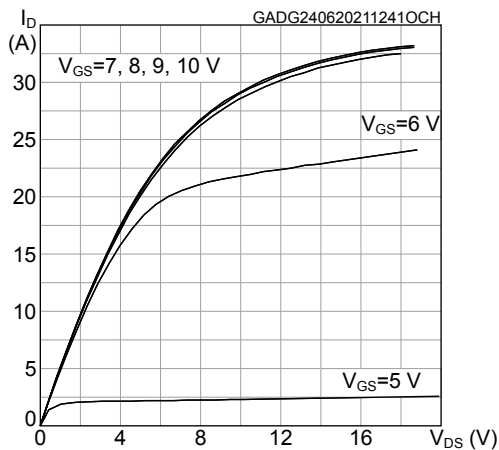


Figure 4. Typical transfer characteristics

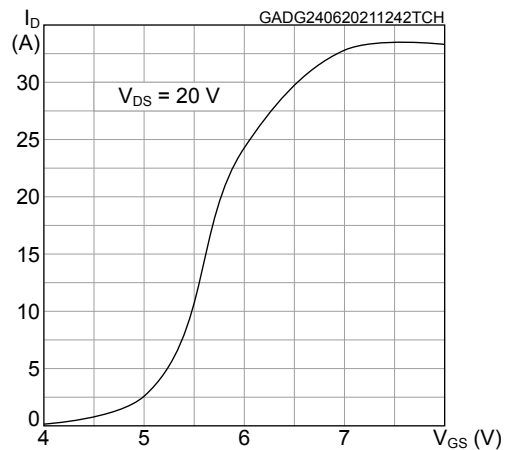


Figure 5. Typical gate charge characteristics

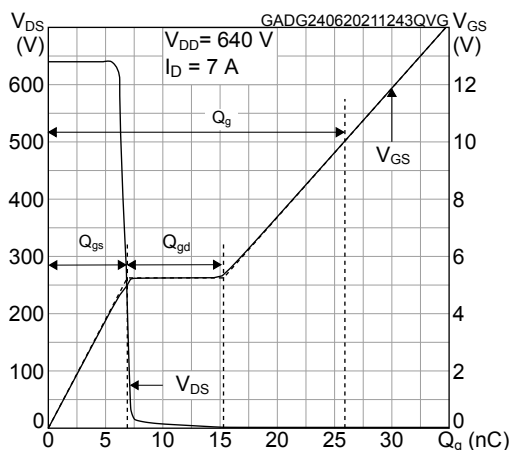


Figure 6. Typical drain-source on-resistance

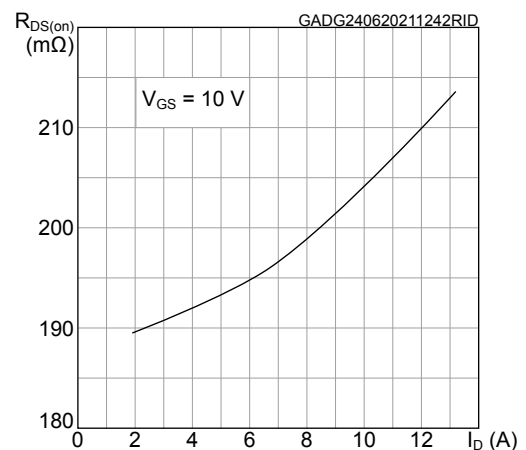


Figure 7. Typical capacitance characteristics

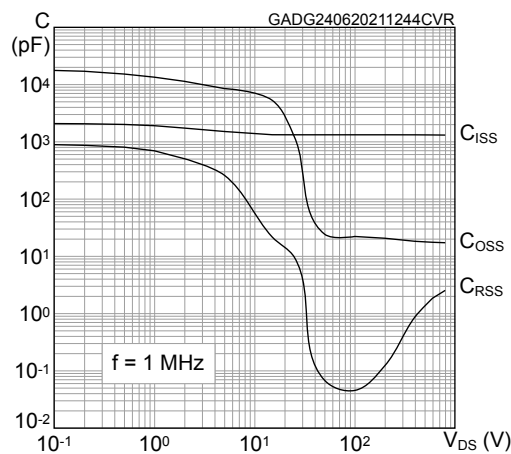


Figure 8. Typical output capacitance stored energy

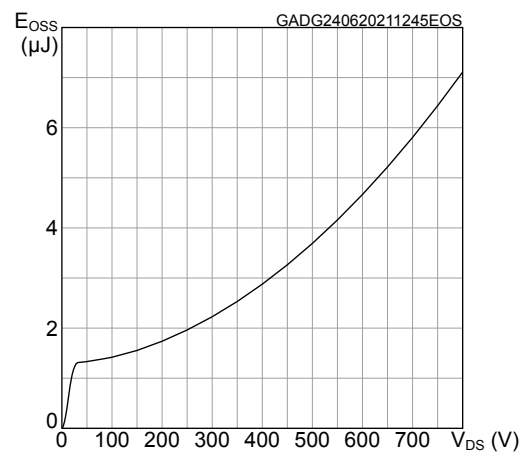


Figure 9. Normalized gate threshold vs temperature

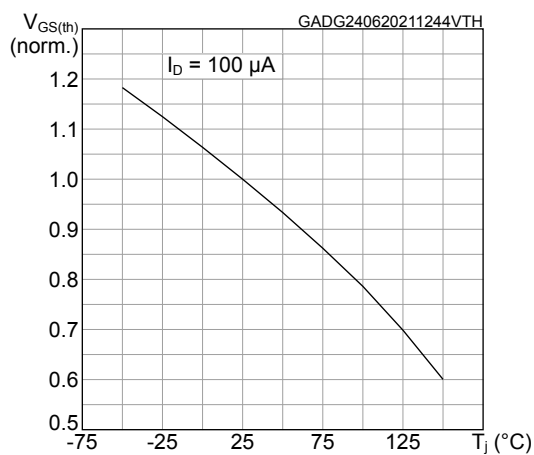


Figure 10. Normalized on-resistance vs temperature

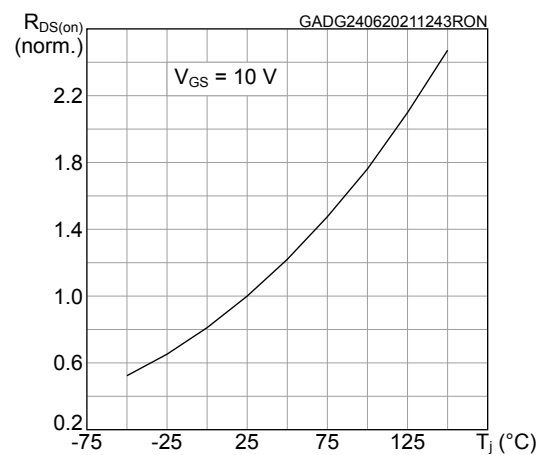


Figure 11. Normalized breakdown voltage vs temperature

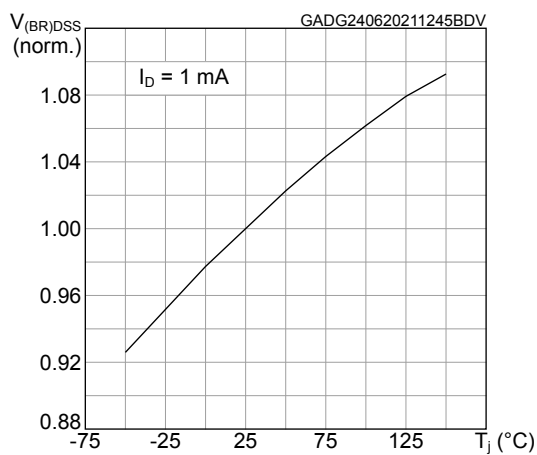


Figure 12. Typical reverse diode forward characteristics

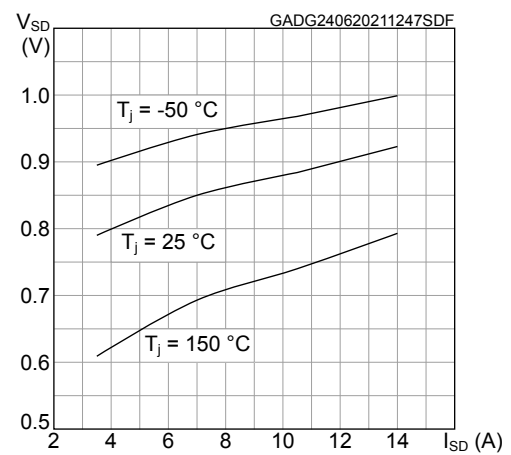


Figure 13. Maximum avalanche energy vs temperature

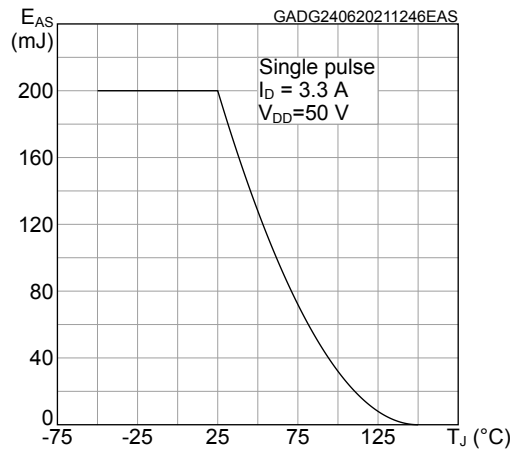


Figure 14. Typical output capacitance stored energy

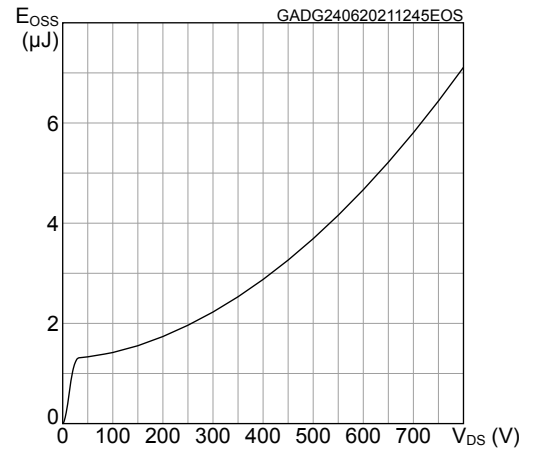


Figure 15. Inductive load: energy losses vs I_D

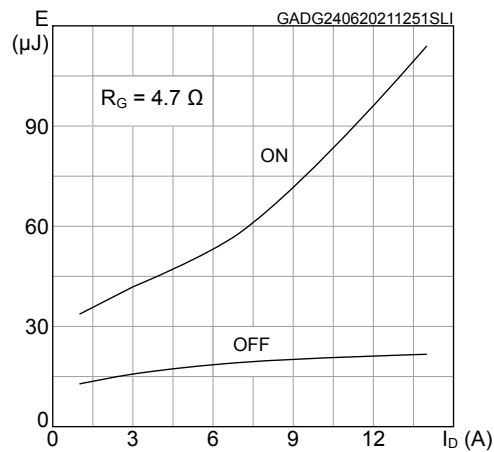
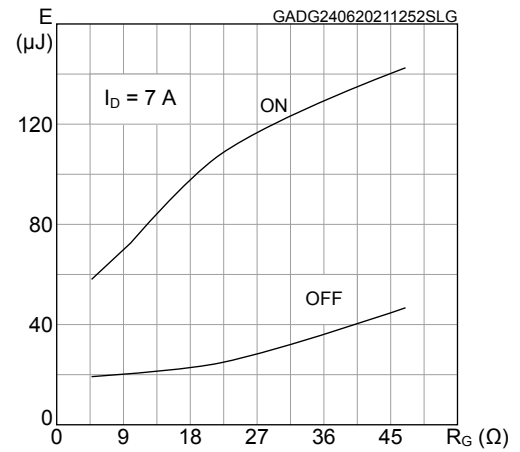
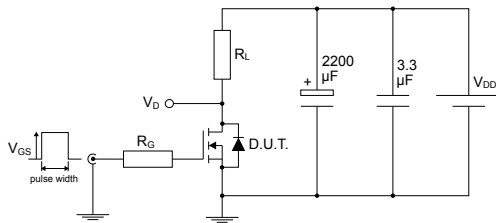


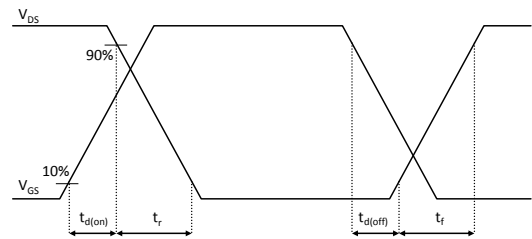
Figure 16. Inductive load: energy losses vs R_G



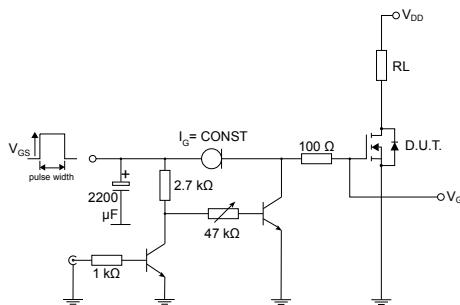
3 Test circuits

Figure 17. Test circuit for resistive load switching times


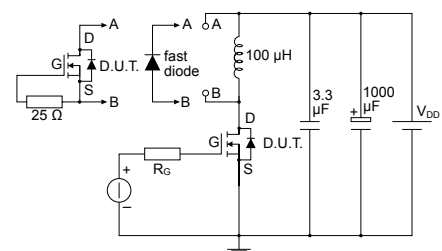
AM01468v1

Figure 18. Switching time waveform


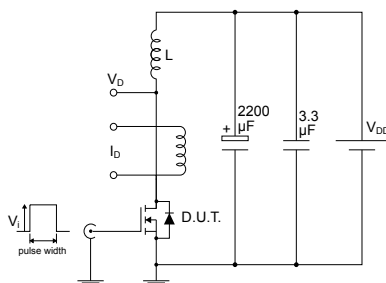
GADG280620211209SA

Figure 19. Test circuit for gate charge behavior


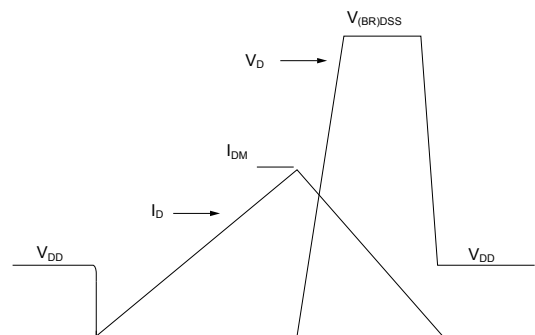
AM01469v10

Figure 20. Test circuit for inductive load switching and diode recovery times


AM01470v1

Figure 21. Unclamped inductive load test circuit


AM01471v1

Figure 22. Unclamped inductive waveform


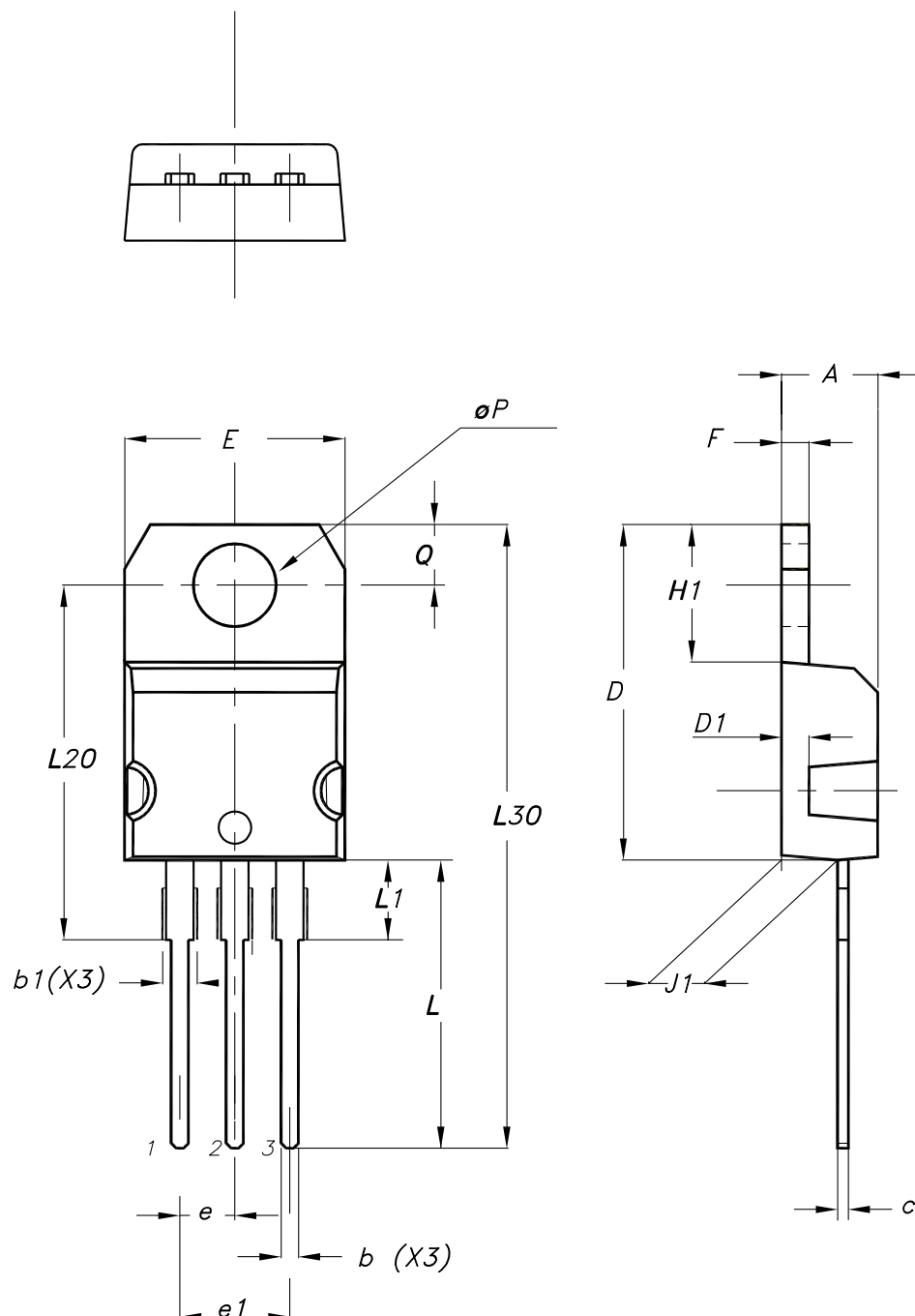
AM01472v1

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 TO-220 type A package information

Figure 23. TO-220 type A package outline



0015988_typeA_Rev_23

Table 8. 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

Revision history

Table 9. Document revision history

Date	Revision	Changes
30-Jun-2021	1	Initial release.

Contents

1	Electrical ratings	2
2	Electrical characteristics.....	3
2.1	Electrical characteristics (curves)	5
3	Test circuits	8
4	Package information.....	9
4.1	TO-220 type A package information	9
	Revision history	11

IMPORTANT NOTICE – PLEASE READ CAREFULLY

STMicroelectronics NV and its subsidiaries ("ST") reserve the right to make changes, corrections, enhancements, modifications, and improvements to ST products and/or to this document at any time without notice. Purchasers should obtain the latest relevant information on ST products before placing orders. ST products are sold pursuant to ST's terms and conditions of sale in place at the time of order acknowledgement.

Purchasers are solely responsible for the choice, selection, and use of ST products and ST assumes no liability for application assistance or the design of Purchasers' products.

No license, express or implied, to any intellectual property right is granted by ST herein.

Resale of ST products with provisions different from the information set forth herein shall void any warranty granted by ST for such product.

ST and the ST logo are trademarks of ST. For additional information about ST trademarks, please refer to www.st.com/trademarks. All other product or service names are the property of their respective owners.

Information in this document supersedes and replaces information previously supplied in any prior versions of this document.

© 2021 STMicroelectronics – All rights reserved

Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

[STMicroelectronics:](#)

[STP80N240K6](#)