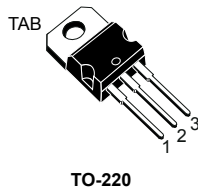
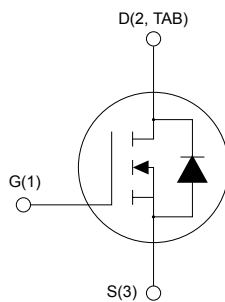


N-channel 550 V, 150 mΩ typ., 16 A MDmesh M5 Power MOSFET in a TO-220 package



TO-220



AM01475v1_noZen


Product status link
[STP18N55M5](#)
Product summary

Order code	STP18N55M5
Marking	18N55M5
Package	TO-220
Packing	Tube

Features

Order code	V_{DS} at T_J max.	$R_{DS(on)}$ max.	I_D
STP18N55M5	600 V	192 mΩ	16 A

- Extremely low $R_{DS(on)}$
- Low gate charge and input capacitance
- Excellent switching performance
- 100% avalanche tested

Applications

- Switching applications

Description

This device is an N-channel Power MOSFET based on the MDmesh M5 innovative vertical process technology combined with the well-known PowerMESH horizontal layout. The resulting product offers extremely low on-resistance, making it particularly suitable for applications requiring high power and superior efficiency.

1 Electrical ratings

Table 1. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{GS}	Gate-source voltage	± 25	V
I_D	Drain current (continuous) at $T_C = 25\text{ }^\circ\text{C}$	16	A
	Drain current (continuous) at $T_C = 100\text{ }^\circ\text{C}$	10	
$I_{DM}^{(1)}$	Drain current (pulsed)	64	A
P_{TOT}	Total power dissipation at $T_C = 25\text{ }^\circ\text{C}$	110	W
$dv/dt^{(2)}$	Peak diode recovery voltage slope	15	V/ns
T_{stg}	Storage temperature range	-55 to 150	$^\circ\text{C}$
T_J	Operating junction temperature range		$^\circ\text{C}$

- Pulse width is limited by safe operating area.*
- $I_{SD} \leq 16\text{ A}$, $di/dt \leq 400\text{ A}/\mu\text{s}$, $V_{DS}(\text{peak}) < V_{(BR)DSS}$, $V_{DD} = 340\text{ V}$.

Table 2. Thermal data

Symbol	Parameter	Value	Unit
R_{thJC}	Thermal resistance, junction-to-case	1.14	$^\circ\text{C}/\text{W}$
R_{thJA}	Thermal resistance, junction-to-ambient	62.5	$^\circ\text{C}/\text{W}$

Table 3. Avalanche characteristics

Symbol	Parameter	Value	Unit
I_{AR}	Avalanche current, repetitive or non-repetitive (pulse width limited by T_J max.)	4	A
E_{AS}	Single pulse avalanche energy (starting $T_J = 25\text{ }^\circ\text{C}$, $I_D = I_{AR}$, $V_{DD} = 50\text{ V}$)	210	mJ

2 Electrical characteristics

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

Table 4. On/off states

Symbol	Parameter	Test condition	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	$I_D = 1\text{ mA}$, $V_{GS} = 0\text{ V}$	550			V
I_{DSS}	Zero gate voltage drain current	$V_{GS} = 0\text{ V}$, $V_{DS} = 550\text{ V}$			1	μA
		$V_{GS} = 0\text{ V}$, $V_{DS} = 550\text{ V}$, $T_C = 125\text{ °C}^{(1)}$			100	
I_{GSS}	Gate body leakage current	$V_{DS} = 0\text{ V}$, $V_{GS} = \pm 25\text{ V}$			± 100	nA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}$, $I_D = 250\text{ }\mu\text{A}$	3	4	5	V
$R_{DS(on)}$	Static drain-source on resistance	$V_{GS} = 10\text{ V}$, $I_D = 8\text{ A}$		150	192	m Ω

1. Specified by design, not tested in production.

Table 5. Dynamic

Symbol	Parameter	Test condition	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	$V_{DS} = 100\text{ V}$, $f = 1\text{ MHz}$, $V_{GS} = 0\text{ V}$	-	1260	-	pF
C_{oss}	Output capacitance		-	42	-	pF
C_{rss}	Reverse transfer capacitance		-	3.6	-	pF
$C_{o(tr)}^{(1)}$	Equivalent capacitance time related	$V_{DS} = 0\text{ to }440\text{ V}$, $V_{GS} = 0\text{ V}$	-	103	-	pF
$C_{o(er)}^{(2)}$	Equivalent capacitance energy related		-	35	-	pF
R_g	Gate input resistance	$f = 1\text{ MHz}$ open drain	-	2.8	-	Ω
Q_g	Total gate charge	$V_{DD} = 440\text{ V}$, $I_D = 8\text{ A}$, $V_{GS} = 0\text{ to }10\text{ V}$ (see Figure 15. Test circuit for gate charge behavior)	-	31	-	nC
Q_{gs}	Gate-source charge		-	8.3	-	nC
Q_{gd}	Gate-drain charge		-	14.2	-	nC

1. Time related is defined as a constant equivalent capacitance giving the same charging time as C_{oss} when V_{DS} increases from 0 to 80% V_{DSS} .

2. Energy related is defined as a constant equivalent capacitance giving the same stored energy as C_{oss} when V_{DS} increases from 0 to 80% V_{DSS} .

Table 6. Switching times

Symbol	Parameter	Test condition	Min.	Typ.	Max.	Unit
$t_{d(v)}$	Voltage delay time	$V_{DD} = 400\text{ V}$, $I_D = 10.5\text{ A}$, $R_G = 4.7\text{ }\Omega$, $V_{GS} = 10\text{ V}$	-	37	-	ns
$t_{r(v)}$	Voltage rise time		-	7	-	ns
$t_{c(off)}$	Crossing time	(see Figure 16. Test circuit for inductive load switching and diode recovery times and Figure 19. Switching time waveform)	-	10.3	-	ns
$t_{f(i)}$	Current fall time		-	8.3	-	ns

Table 7. Source drain diode

Symbol	Parameter	Test condition	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain current		-		16	A
$I_{SDM}^{(1)}$	Source-drain current (pulsed)		-		64	A
$V_{SD}^{(2)}$	Forward on voltage	$I_{SD} = 16\text{ A}$, $V_{GS} = 0\text{ V}$	-		1.5	V
t_{rr}	Reverse recovery time	$I_{SD} = 16\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$,	-	244		ns
Q_{rr}	Reverse recovery charge	$V_{DD} = 100\text{ V}$ (see Figure 16. Test circuit for inductive load switching and diode recovery times)	-	2.8		μC
I_{RRM}	Reverse recovery current	(see Figure 16. Test circuit for inductive load switching and diode recovery times)	-	23		A
t_{rr}	Reverse recovery time	$I_{SD} = 16\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$	-	295		ns
Q_{rr}	Reverse recovery charge	$V_{DD} = 100\text{ V}$, $T_J = 150\text{ }^\circ\text{C}$ (see Figure 16. Test circuit for inductive load switching and diode recovery times)	-	3.7		μC
I_{RRM}	Reverse recovery current	(see Figure 16. Test circuit for inductive load switching and diode recovery times)	-	25		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

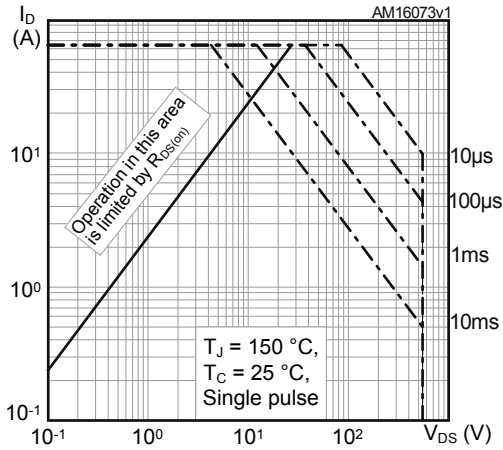


Figure 2. Thermal impedance

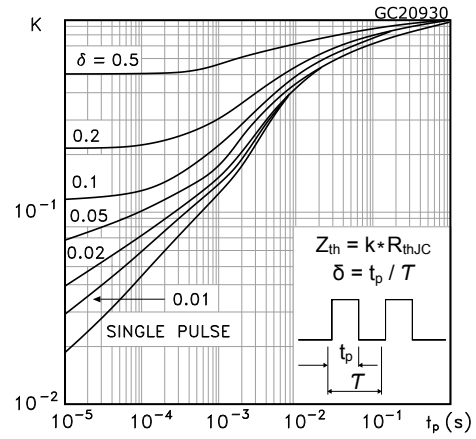


Figure 3. Output characteristics

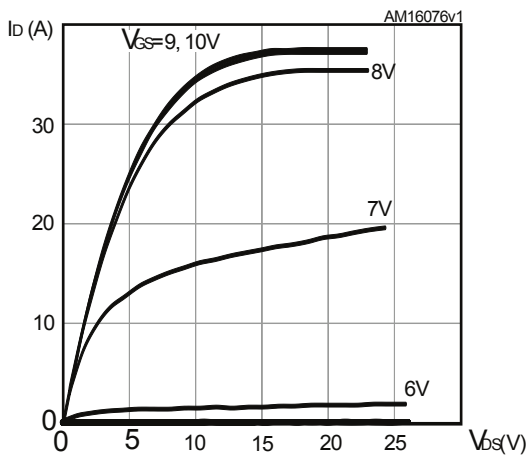


Figure 4. Transfer characteristics

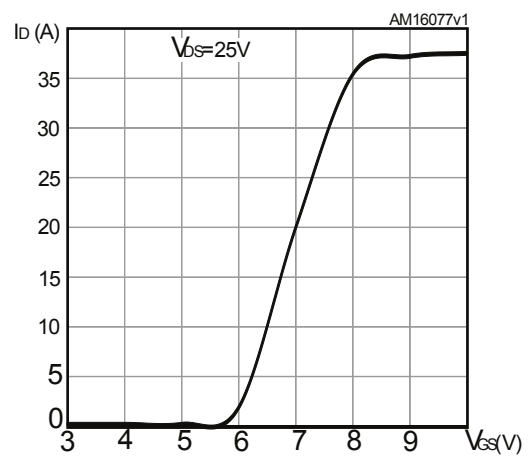


Figure 5. Gate charge vs gate-source voltage

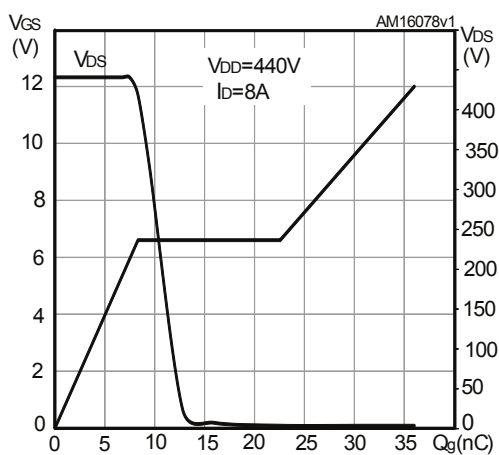


Figure 6. Static drain-source on resistance

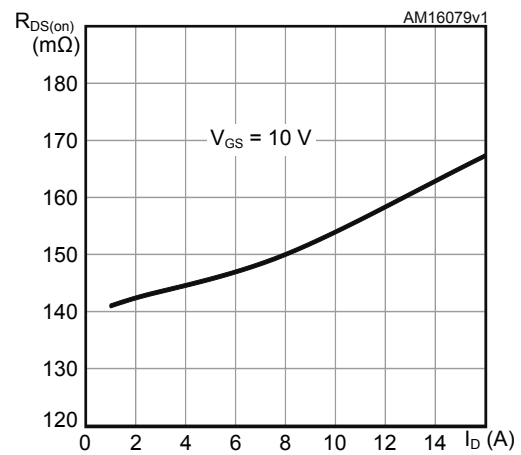


Figure 7. Capacitance variations

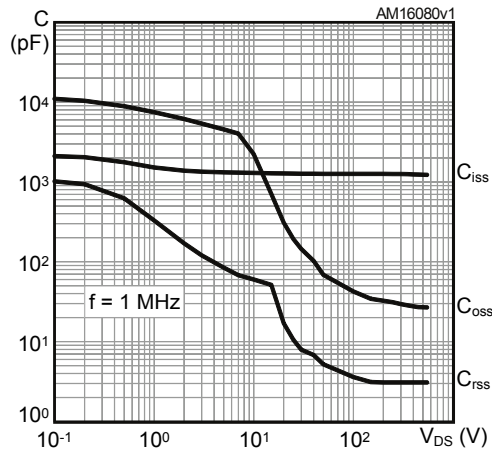


Figure 8. Output capacitance stored energy

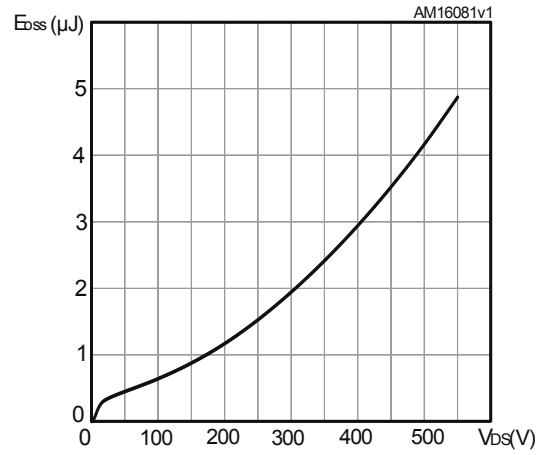


Figure 9. Normalized gate threshold voltage vs temperature

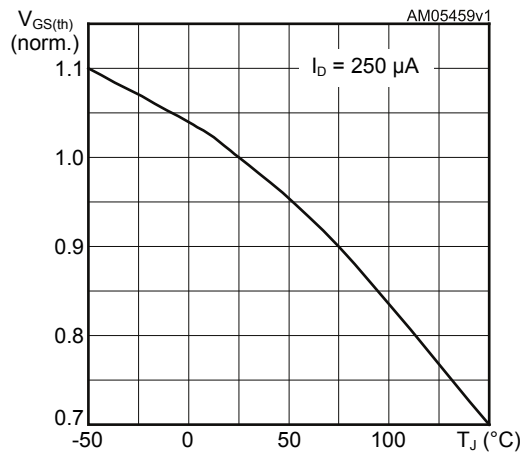


Figure 10. Normalized on-resistance vs temperature

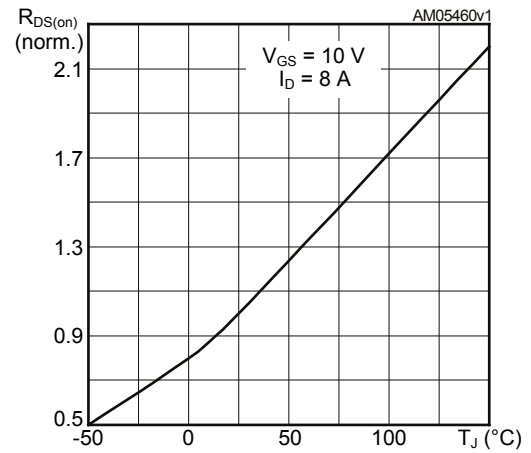


Figure 11. Drain-source diode forward characteristics

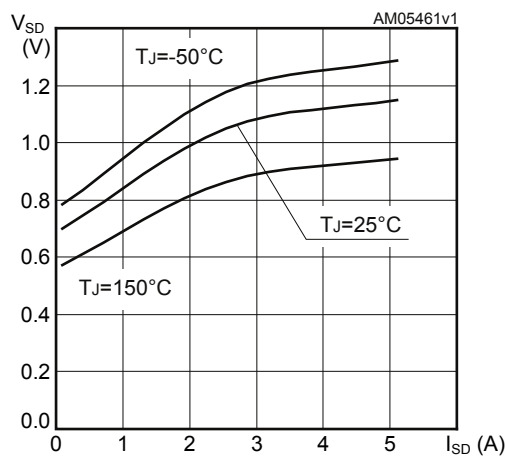


Figure 12. Normalized $V_{(BR)DSS}$ vs temperature

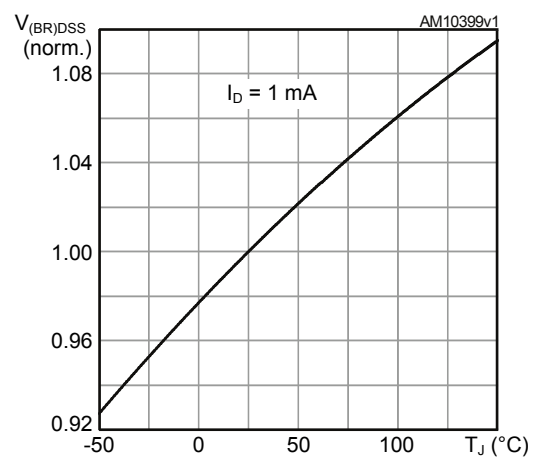
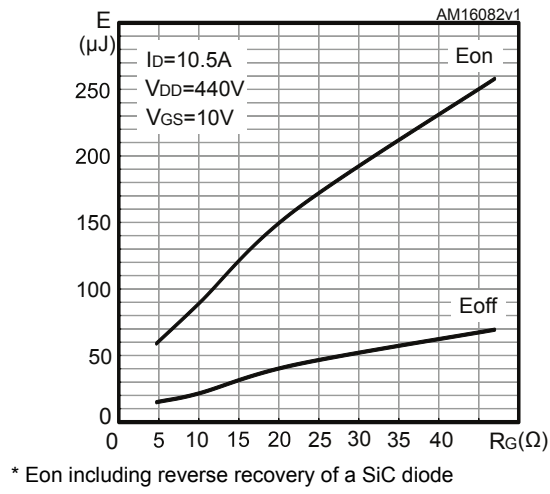
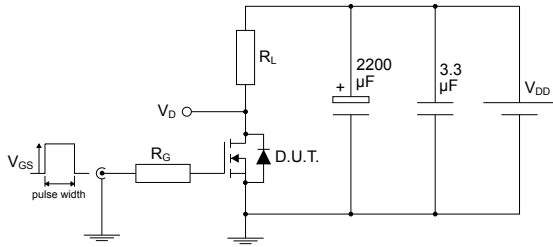


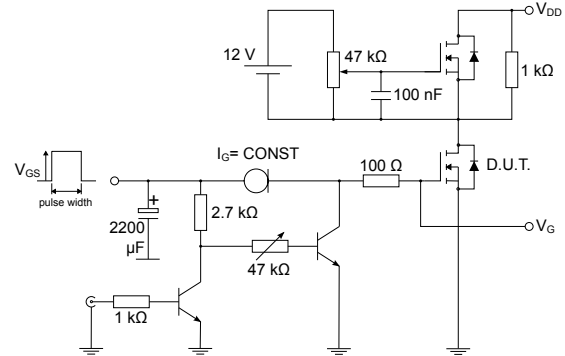
Figure 13. Switching energy vs gate resistance



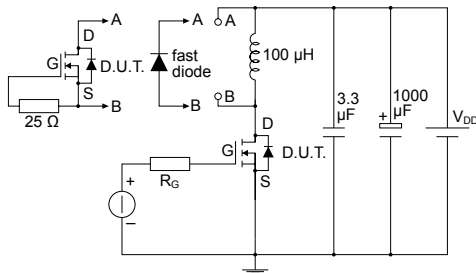
3 Test circuits

Figure 14. Test circuit for resistive load switching times


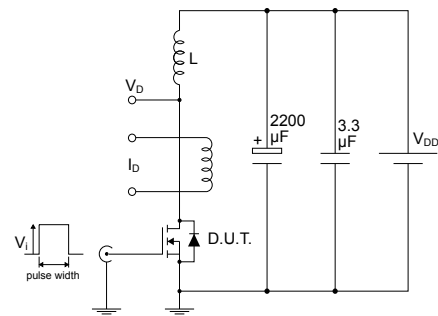
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Figure 15. Test circuit for gate charge behavior


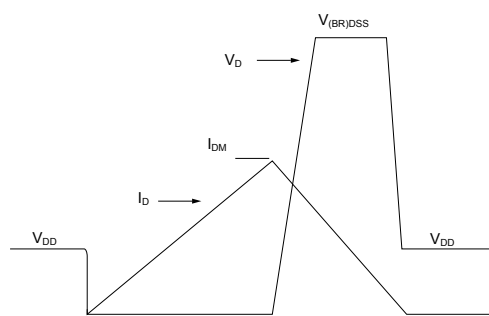
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Figure 16. Test circuit for inductive load switching and diode recovery times


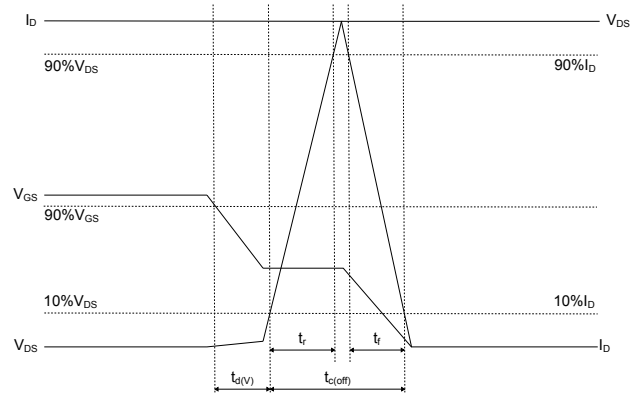
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Figure 17. Unclamped inductive load test circuit


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Figure 18. Unclamped inductive waveform


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Figure 19. Switching time waveform


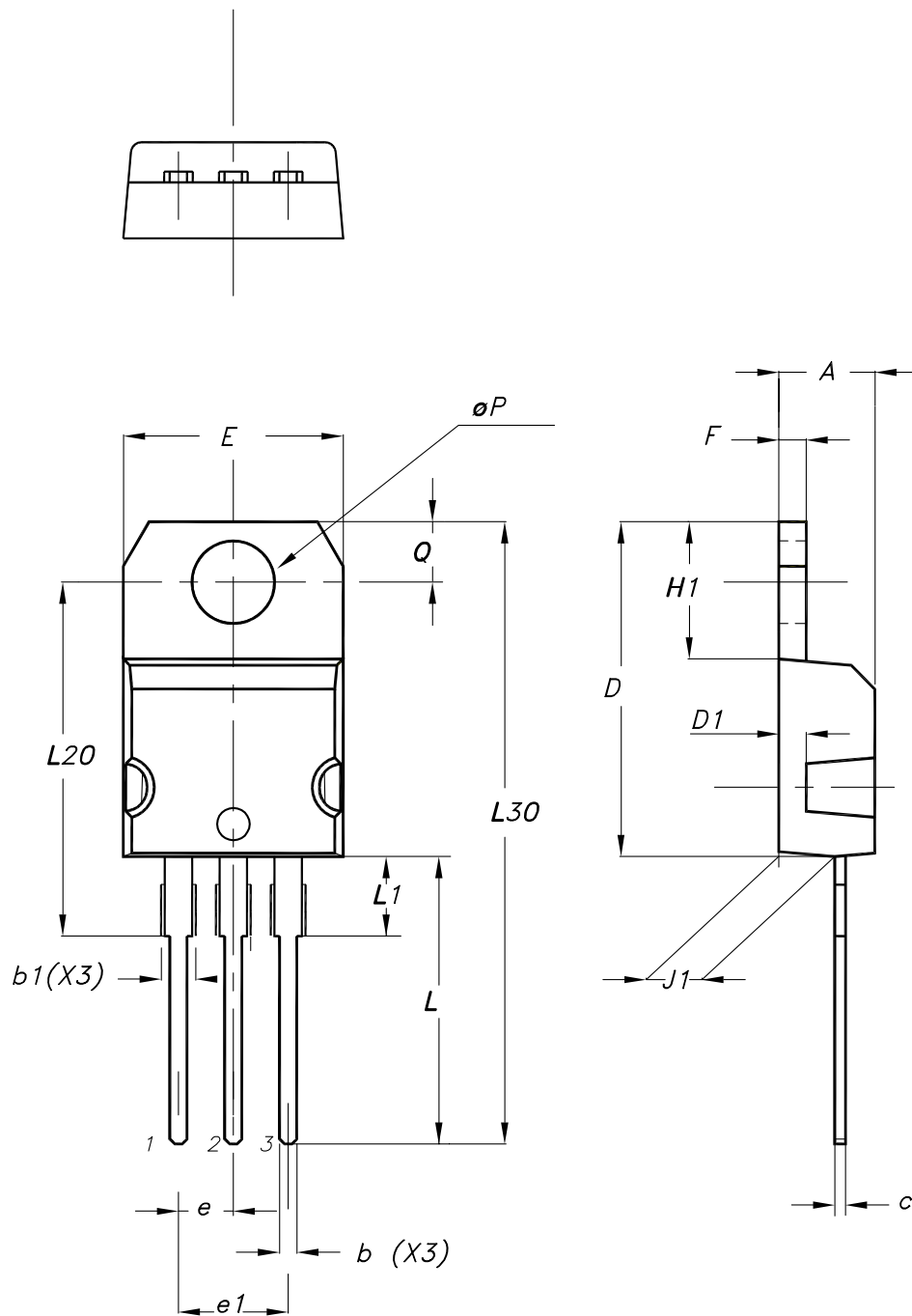
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4 Package information

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 20. 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
31-Aug-2023	1	First release. The part number STP18N55M5 was previously inserted in the DS6705.

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

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