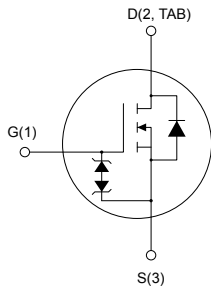
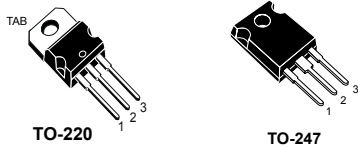


N-channel 600 V, 85 mΩ typ., 30 A MDmesh M6 Power MOSFETs in a TO-220 and TO-247 packages



AM01476v1_tab



Features

Order code	V _{DS}	R _{DS(on)} max.	I _D
STP36N60M6	600 V	99 mΩ	30 A
STW36N60M6			

- Reduced switching losses
- Lower R_{DS(on)} per area vs previous generation
- Low gate input resistance
- 100% avalanche tested
- Zener-protected

Applications

- Switching applications

Description

The new MDmesh M6 technology incorporates the most recent advancements to the well-known and consolidated MDmesh family of SJ MOSFETs. STMicroelectronics builds on the previous generation of MDmesh devices through its new M6 technology, which combines excellent R_{DS(on)} per area improvement with one of the most effective switching behaviors available, as well as a user-friendly experience for maximum end-application efficiency.

Product status links

[STP36N60M6](#)

[STW36N60M6](#)

Product summary

Order code	STP36N60M6
Marking	36N60M6
Package	TO-220
Packing	Tube
Order code	STW36N60M6
Marking	36N60M6
Package	TO-247
Packing	Tube

1 Electrical ratings

Table 1. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source voltage	600	V
V_{GS}	Gate-source voltage	±25	V
I_D	Drain current (continuous) at $T_C = 25\text{ °C}$	30	A
	Drain current (continuous) at $T_C = 100\text{ °C}$	19	
$I_{DM}^{(1)}$	Drain current (pulsed)	102	A
P_{TOT}	Total power dissipation at $T_C = 25\text{ °C}$	208	W
$dv/dt^{(2)}$	Peak diode recovery voltage slope	15	V/ns
$dv/dt^{(3)}$	MOSFET dv/dt ruggedness	50	
T_{stg}	Storage temperature range	-55 to 150	°C
T_J	Operating junction temperature range		

1. Pulse width limited by safe operating area.
2. $I_{SD} \leq 30\text{ A}$, $di/dt \leq 400\text{ A}/\mu\text{s}$, $V_{DS} (\text{peak}) < V_{(BR)DSS}$, $V_{DD} = 400\text{ V}$.
3. $V_{DD} \leq 480\text{ V}$.

Table 2. Thermal data

Symbol	Parameter	Value		Unit
		TO-220	TO-247	
R_{thJC}	Thermal resistance, junction-to-case	0.6		°C/W
R_{thJA}	Thermal resistance junction-to-ambient	62.5	50	°C/W

Table 3. Avalanche characteristics

Symbol	Parameter	Value	Unit
I_{AR}	Avalanche current, repetitive or non-repetitive (pulse width limited by T_J max.)	5	A
E_{AS}	Single pulse avalanche energy (starting $T_J = 25\text{ °C}$, $I_D = I_{AR}$, $V_{DD} = 50\text{ V}$)	750	mJ

2 Electrical characteristics

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

Table 4. On/off states

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	$V_{GS} = 0\text{ V}$, $I_D = 1\text{ mA}$	600	-	-	V
I_{DSS}	Zero gate voltage drain current	$V_{GS} = 0\text{ V}$, $V_{DS} = 600\text{ V}$	-	-	1	μA
		$V_{GS} = 0\text{ V}$, $V_{DS} = 600\text{ V}$, $T_C = 125\text{ °C}^{(1)}$	-	-	100	
I_{GSS}	Gate body leakage current	$V_{DS} = 0\text{ V}$, $V_{GS} = \pm 25\text{ V}$	-	-	± 5	μA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}$, $I_D = 250\text{ }\mu\text{A}$	3.25	4	4.75	V
$R_{DS(on)}$	Static drain-source on-resistance	$I_D = 15\text{ A}$, $V_{GS} = 10\text{ V}$	-	85	99	m Ω

1. Specified by design, not tested in production.

Table 5. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	$V_{DS} = 100\text{ V}$, $f = 1\text{ MHz}$, $V_{GS} = 0\text{ V}$	-	1960	-	pF
C_{oss}	Output capacitance		-	93	-	pF
C_{rss}	Reverse transfer capacitance		-	6	-	pF
$C_{oss\text{ eq.}}^{(1)}$	Equivalent output capacitance	$V_{DS} = 0\text{ to }480\text{ V}$, $V_{GS} = 0\text{ V}$	-	332	-	pF
R_g	Intrinsic gate resistance	$f = 1\text{ MHz}$, $I_D = 0\text{ A}$	-	1.6	-	Ω
Q_g	Total gate charge	$V_{DD} = 480\text{ V}$, $I_D = 30\text{ A}$, $V_{GS} = 0\text{ to }10\text{ V}$ (see the Figure 16. Test circuit for gate charge behavior)	-	44.3	-	nC
Q_{gs}	Gate-source charge		-	10.1	-	nC
Q_{gd}	Gate-drain charge		-	25	-	nC

1. $C_{oss\text{ eq.}}$ 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} .

Table 6. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{DD} = 300\text{ V}$, $I_D = 15\text{ A}$, $R_G = 4.7\text{ }\Omega$, $V_{GS} = 10\text{ V}$	-	15.2	-	ns
t_r	Rise time		-	5.3	-	ns
$t_{d(off)}$	Turn-off delay time	(see the Figure 15. Test circuit for resistive load switching times and Figure 20. Switching time waveform)	-	50.2	-	ns
t_f	Fall time		-	7.3	-	ns

Table 7. Source-drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain current		-	-	30	A
$I_{SDM}^{(1)}$	Source-drain current (pulsed)		-	-	102	A
$V_{SD}^{(2)}$	Forward on voltage	$I_{SD} = 30\text{ A}$, $V_{GS} = 0\text{ V}$	-	-	1.6	V
t_{rr}	Reverse recovery time	$I_{SD} = 30\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$,	-	340	-	ns
Q_{rr}	Reverse recovery charge	$V_{DD} = 60\text{ V}$	-	5.3	-	μC
I_{RRM}	Reverse recovery current	(see the Figure 17. Test circuit for inductive load switching and diode recovery times)	-	31	-	A
t_{rr}	Reverse recovery time	$I_{SD} = 30\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$,	-	430	-	ns
Q_{rr}	Reverse recovery charge	$V_{DD} = 60\text{ V}$, $T_J = 150\text{ }^\circ\text{C}$	-	7.7	-	μC
I_{RRM}	Reverse recovery current	(see the Figure 17. Test circuit for inductive load switching and diode recovery times)	-	36	-	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 TO-220

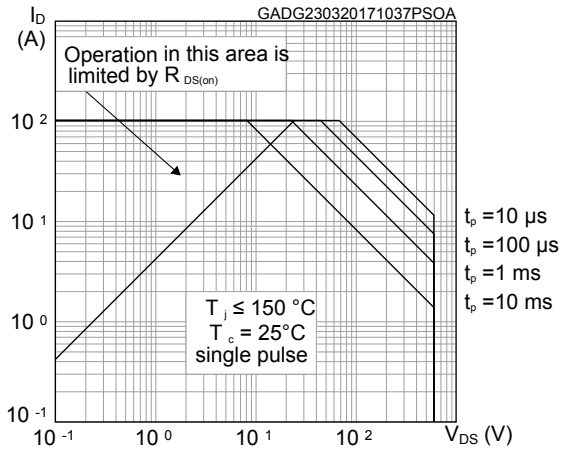


Figure 2. Normalized transient thermal impedance for TO-220

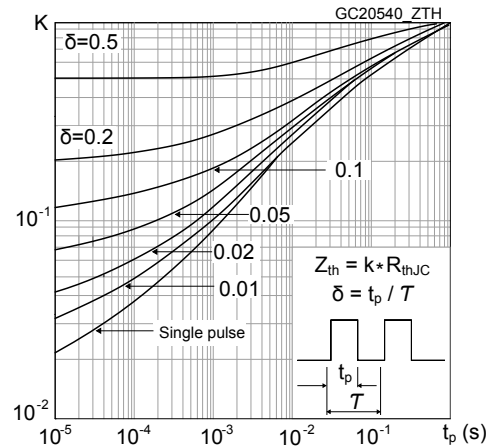


Figure 3. Safe operating area for TO-247

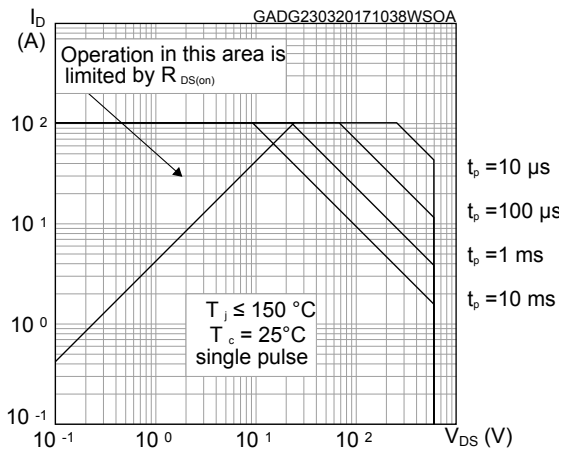


Figure 4. Normalized transient thermal impedance for TO-247

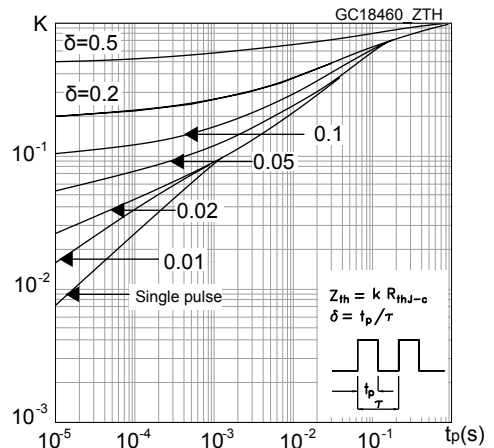


Figure 5. Typical output characteristics

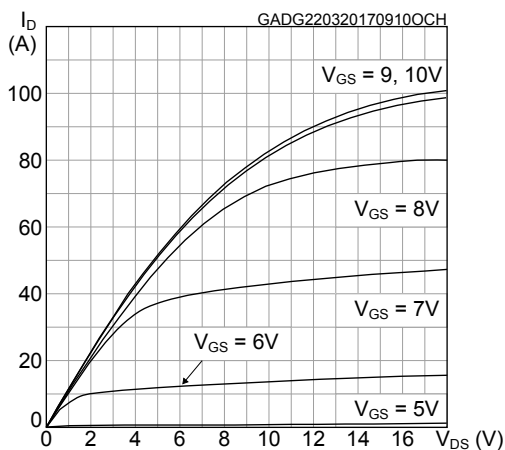


Figure 6. Typical transfer characteristics

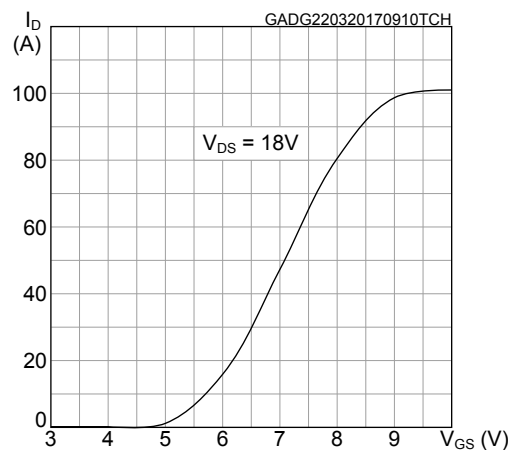


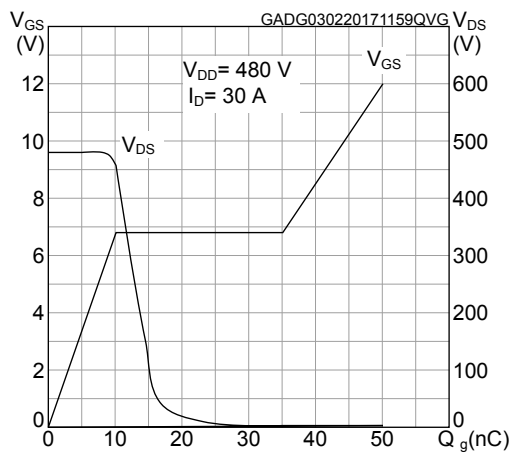
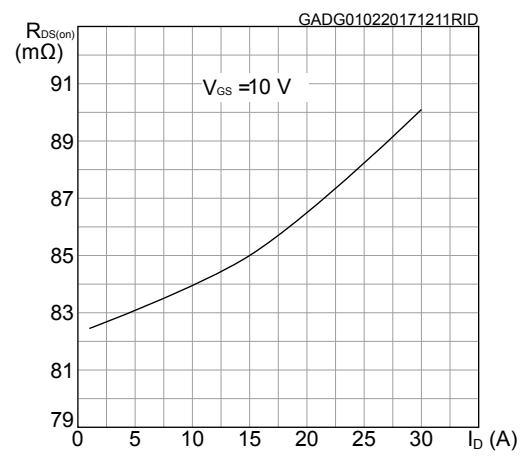
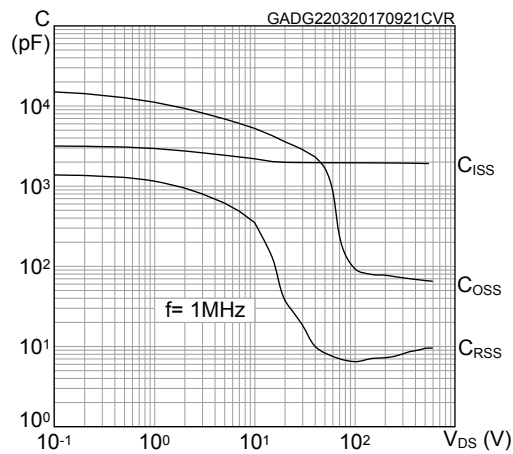
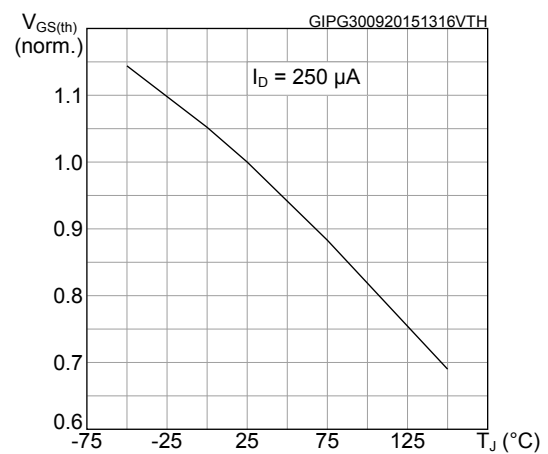
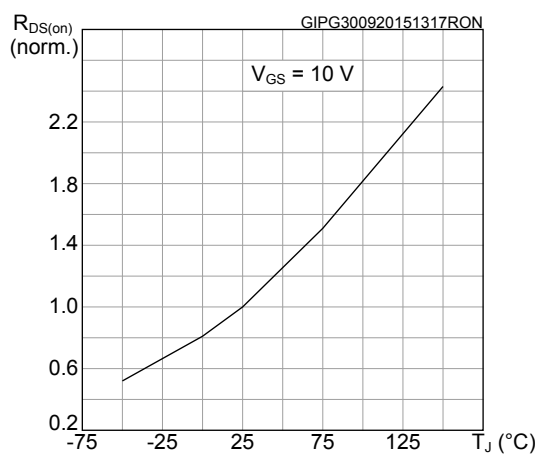
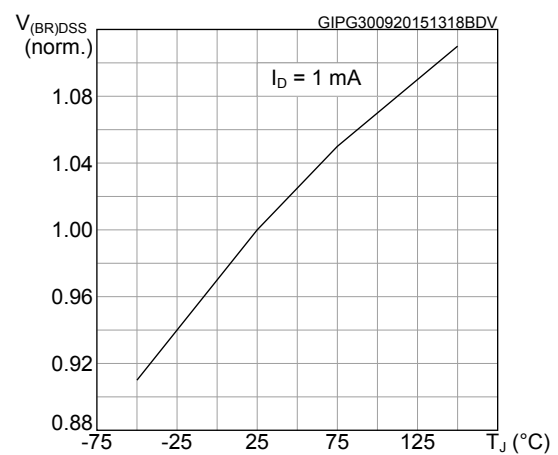
Figure 7. Typical gate charge characteristics

Figure 8. Typical drain-source on-resistance

Figure 9. Typical capacitance characteristics

Figure 10. Normalized gate threshold vs temperature

Figure 11. Normalized on-resistance vs temperature

Figure 12. Normalized breakdown voltage vs temperature


Figure 13. Typical output capacitance stored energy

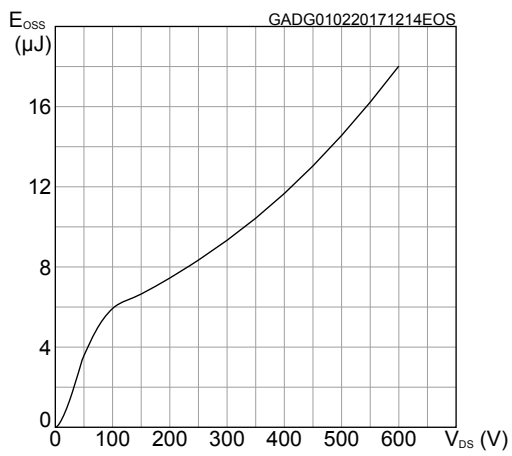
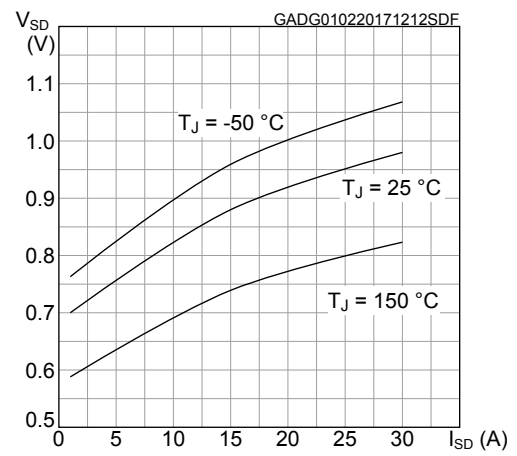
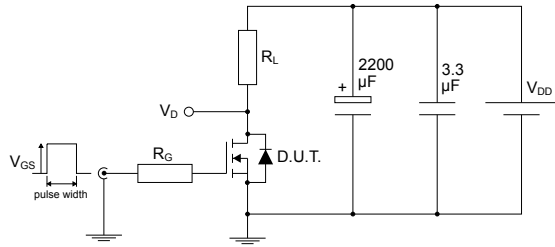


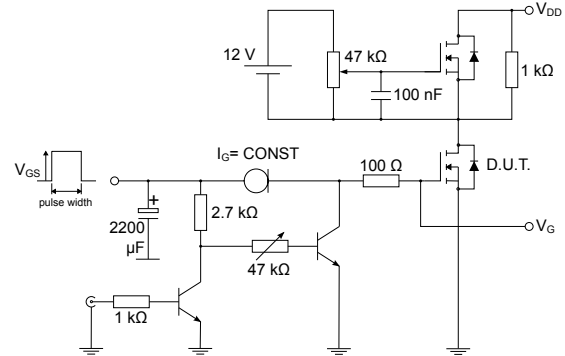
Figure 14. Typical reverse diode forward characteristics



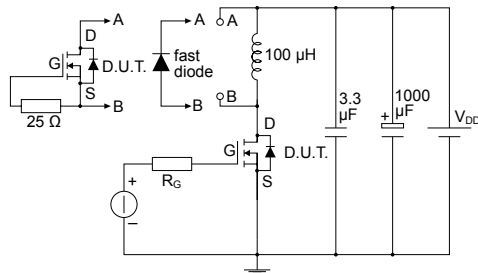
3 Test circuits

Figure 15. Test circuit for resistive load switching times


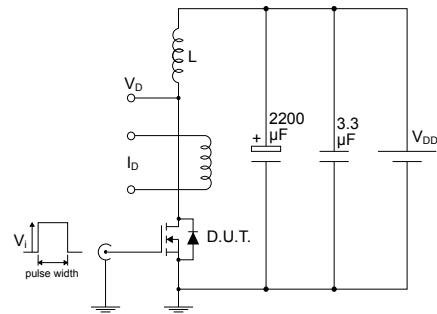
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Figure 16. Test circuit for gate charge behavior


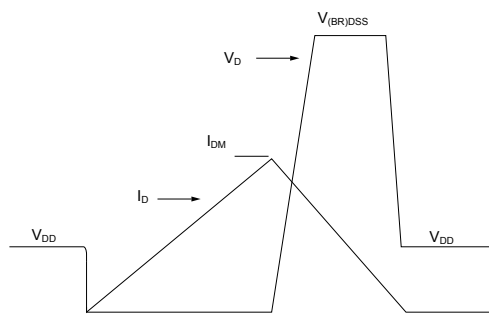
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Figure 17. Test circuit for inductive load switching and diode recovery times


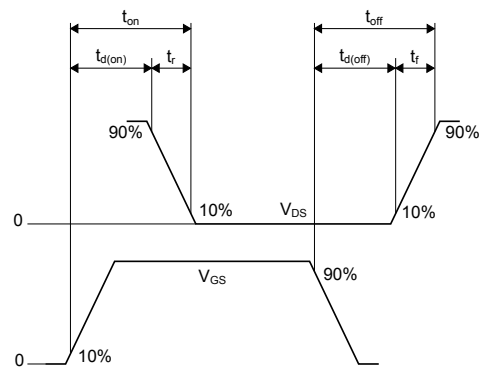
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Figure 18. Unclamped inductive load test circuit


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Figure 19. Unclamped inductive waveform


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Figure 20. Switching time waveform


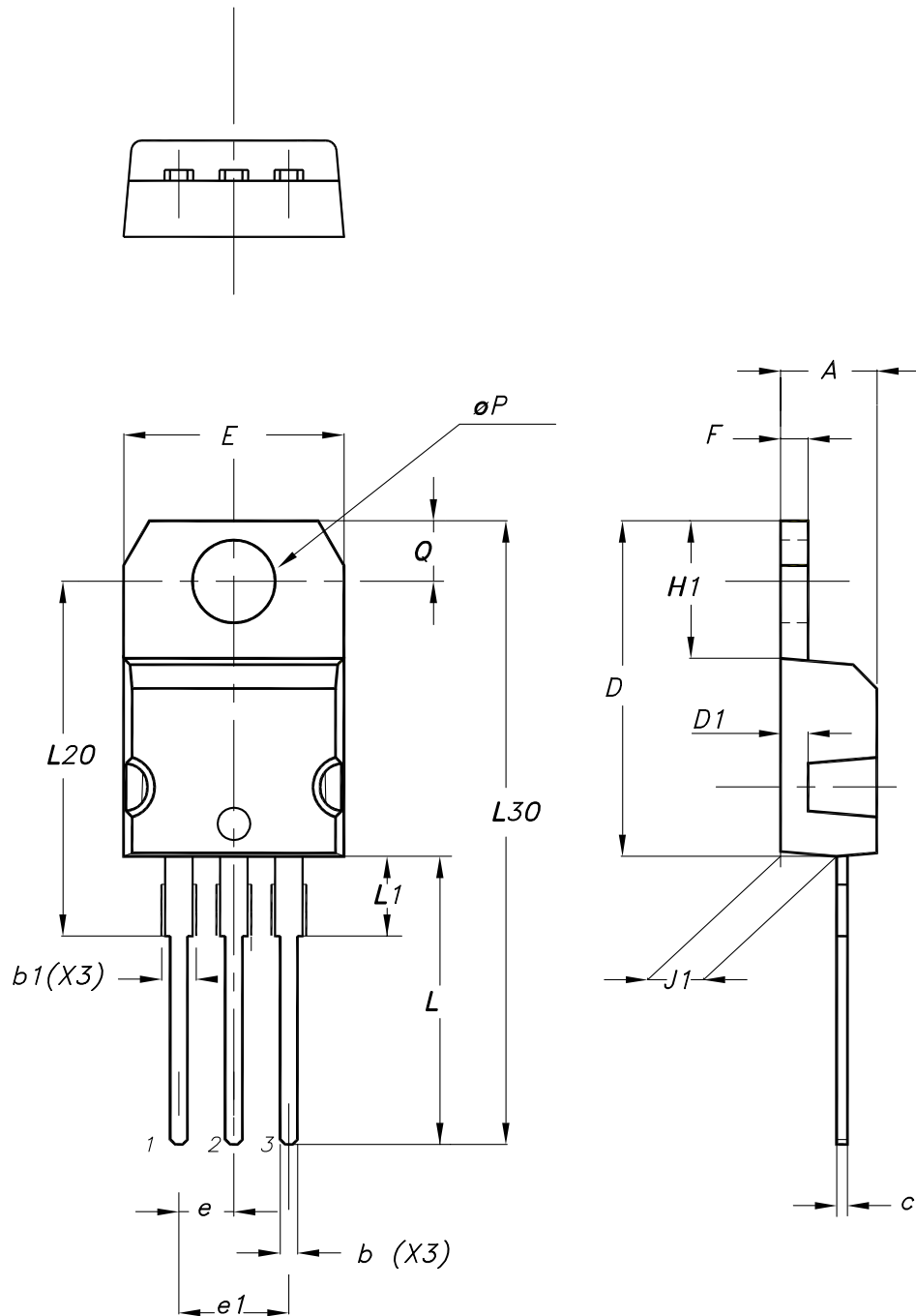
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4 Package information

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 TO-220 type A package information

Figure 21. TO-220 type A package outline



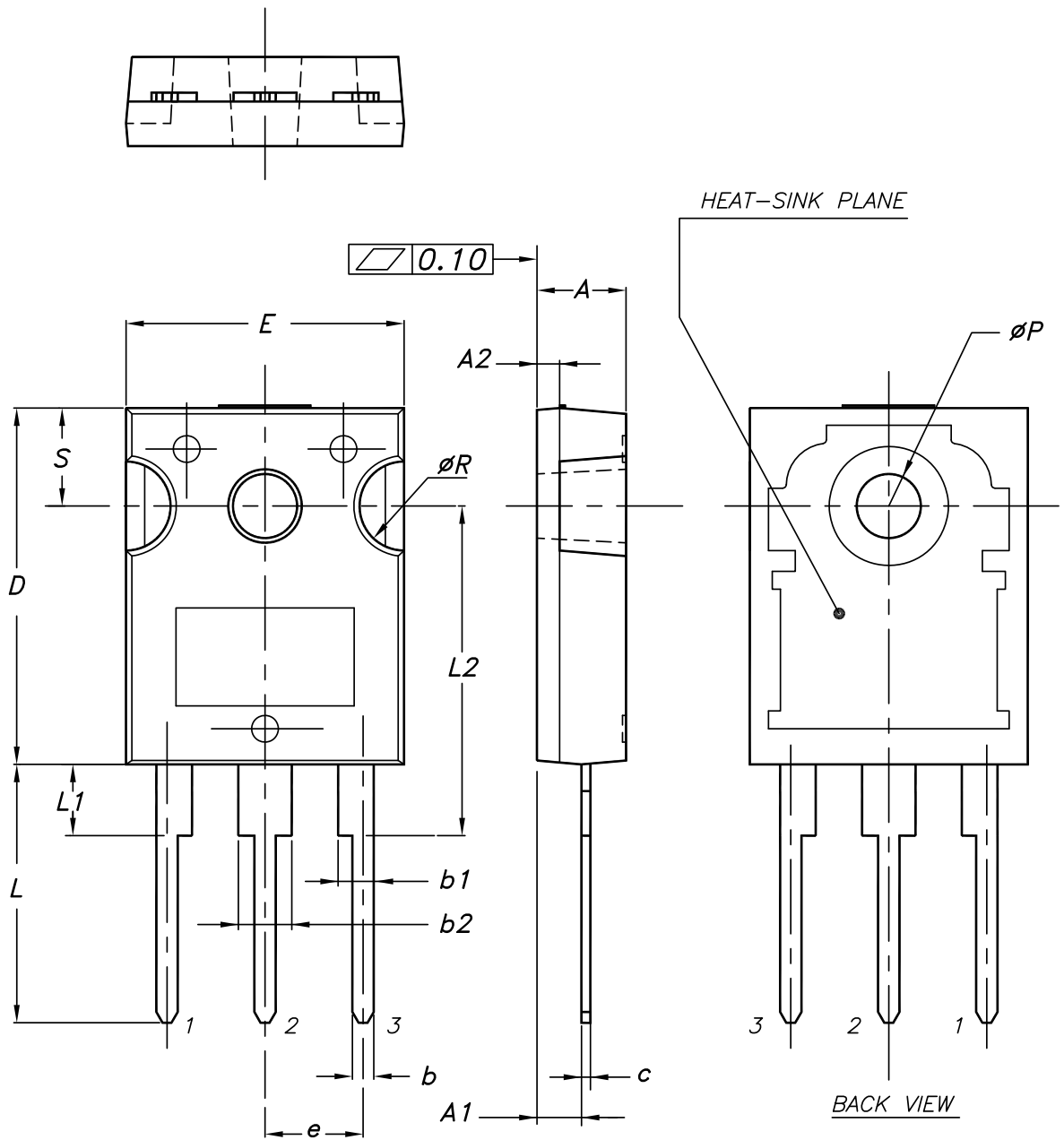
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Table 8. TO-220 type A package mechanical data

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

4.2 TO-247 package information

Figure 22. TO-247 package outline



0075325_11

Table 9. TO-247 package mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	4.85		5.15
A1	2.20		2.60
A2		1.27	
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

Revision history

Table 10. Document revision history

Date	Version	Changes
06-Oct-2015	1	First release.
14-Oct-2015	2	Updated: V_{DD} value in <i>Table 8: "Source drain diode"</i> . Minor text changes.
27-Mar-2017	3	Updated <i>Table 2: "Absolute maximum ratings"</i> . Updated <i>Section 2: "Electrical characteristics"</i> . Updated <i>Section 4: "Package information"</i> . Minor text changes.
13-Jan-2026	4	Updated <i>Section 4: Package information</i> . Minor text changes.

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