STWA70N60DM2

N-channel 600 V, 37 mΩ typ., 66 A MDmesh DM2 Power MOSFET in a TO-247 long leads package

TO-247 long leads

D(2, TAB)

G(1)

S(3)

AM01476v1_tab

Features

Order code	V_{DS}	$R_{DS(on)}$ max.	I_D
STWA70N60DM2	600 V	42 mΩ	66 A

- Fast-recovery body diode
- Extremely low gate charge and input capacitance
- Low on-resistance
- 100% avalanche tested
- Extremely high dv/dt ruggedness
- Zener-protected

Applications

- Switching applications

Description

This high-voltage N-channel Power MOSFET is part of the MDmesh DM2 fast-recovery diode series. It offers very low recovery charge (Q_{rr}) and time (t_{rr}) combined with low $R_{DS(on)}$, rendering it suitable for the most demanding high-efficiency converters and ideal for bridge topologies and ZVS phase-shift converters.

STPOWER

Product status link
STWA70N60DM2

Product summary	
Order code	STWA70N60DM2
Marking	70N60DM2
Package	TO-247 long leads
Packing	Tube

DS11064 - Rev 3 - March 2025
For further information, contact your local STMicroelectronics sales office.

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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 °C	66	A
	Drain current (continuous) at T_C = 100 °C	42	
I_{DM}[1]	Drain current (pulsed)	264	A
P_{TOT}	Total power dissipation at T_C = 25 °C	446	W
dv/dt[2]	Peak diode recovery voltage slope	50	V/ns
dv/dt[3]	MOSFET dv/dt ruggedness	50	V/ns
T_{stg}	Storage temperature range	-55 to 150	°C
T_J	Operating junction temperature range		°C

1. *Pulse width limited by safe operating area.*

2. *$I_{SD} \leq 66$ A, V_{DS} (peak) < $V_{(BR)DSS}$, di/dt = 900 A/µs, V_{DD} = 400 V.*

3. *V_{DD} = 480 V.*

Table 2. Thermal data

Symbol	Parameter	Value	Unit
R_{thJC}	Thermal resistance, junction-to-case	0.28	°C/W
R_{thJA}	Thermal resistance, junction-to-ambient	50	°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.)	10	A
E_{AS}	Single pulse avalanche energy (starting T_J = 25 °C, I_D = I_{AR}, V_{DD} = 50 V)	1500	mJ

2 Electrical characteristics

T_C = 25 °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 V, I_D = 1 mA	600			V
I_{DSS}	Zero gate voltage drain current	V_{GS} = 0 V, V_{DS} = 600 V			10	µA
		V_{GS} = 0 V, V_{DS} = 600 V, T_C = 125 °C [1]			100	
I_{GSS}	Gate-body leakage current	V_{DS} = 0 V, V_{GS} = ±25 V			±5	µA
$V_{GS(th)}$	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 = 33 A		37	42	mΩ

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

Table 5. Dynamic characteristics

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	V_{DS} = 100 V, f = 1 kHz, V_{GS} = 0 V	-	5508	-	pF
C_{oss}	Output capacitance		-	241	-	pF
C_{rss}	Reverse transfer capacitance		-	2.8	-	pF
$C_{oss\ eq.}$ [1]	Equivalent output capacitance	V_{DS} = 0 to 480 V, V_{GS} = 0 V	-	470	-	pF
R_g	Intrinsic gate resistance	f = 1 MHz, I_D = 0 A	-	2	-	Ω
Q_g	Total gate charge	V_{DD} = 480 V, I_D = 66 A, V_{GS} = 0 to 10 V (see Figure 14. Test circuit for gate charge behavior)	-	121	-	nC
Q_{gs}	Gate-source charge		-	26	-	nC
Q_{gd}	Gate-drain charge		-	61	-	nC

1. *$C_{oss\ eq}$ is defined as a constant equivalent capacitance giving the same charging time as C_{oss} when V_{DS} increases from 0 to stated value.*

Table 6. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	V_{DD} = 300 V, I_D = 33 A,	-	32	-	ns
t_r	Rise time	R_G = 4.7 Ω , V_{GS} = 10 V	-	67	-	ns
$t_{d(off)}$	Turn-off delay time	(see Figure 13. Test circuit for resistive load switching times and Figure 18. Switching time waveform)	-	112	-	ns
t_f	Fall time		-	10.4	-	ns

Table 7. Source-drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain current		-		66	A
I_{SDM}[1]	Source-drain current (pulsed)		-		264	A
V_{SD}[2]	Forward on voltage	V_{GS} = 0 V, I_{SD} = 66 A	-		1.6	V
t_{rr}	Reverse recovery time	I_{SD} = 66 A, di/dt = 100 A/µs,	-	150		ns
Q_{rr}	Reverse recovery charge	V_{DD} = 60 V (see Figure 15. Test circuit for inductive load switching and diode recovery times)	-	0.75		µC
I_{RRM}	Reverse recovery current		-	10.5		A
t_{rr}	Reverse recovery time	I_{SD} = 66 A, di/dt = 100 A/µs,	-	250		ns
Q_{rr}	Reverse recovery charge	V_{DD} = 60 V, T_J = 150 °C	-	2.5		µC
I_{RRM}	Reverse recovery current	(see Figure 15. Test circuit for inductive load switching and diode recovery times)	-	20.7		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
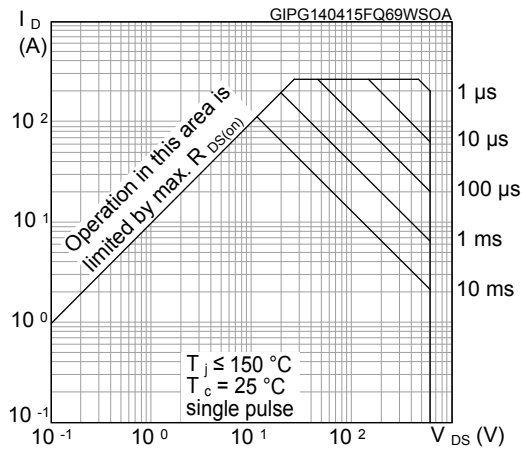
Figure 2. Normalized transient thermal impedance
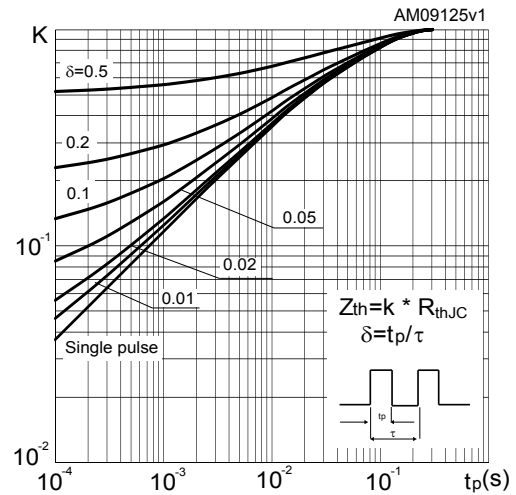
Figure 3. Typical output characteristics
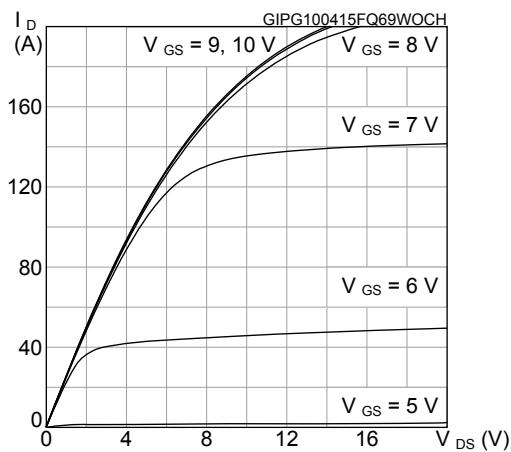
Figure 4. Typical transfer characteristics
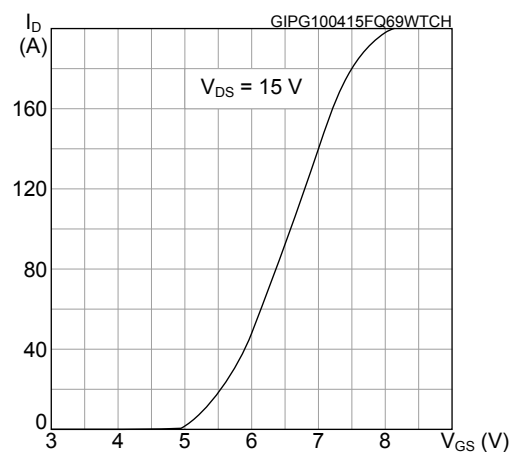
Figure 5. Typical gate charge characteristics
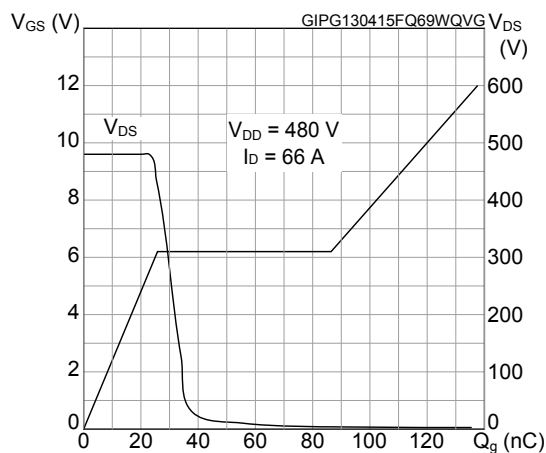
Figure 6. Typical drain-source on-resistance
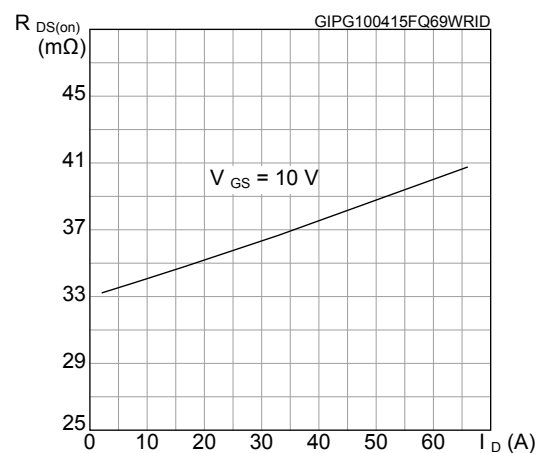
Figure 7. Typical capacitance characteristics
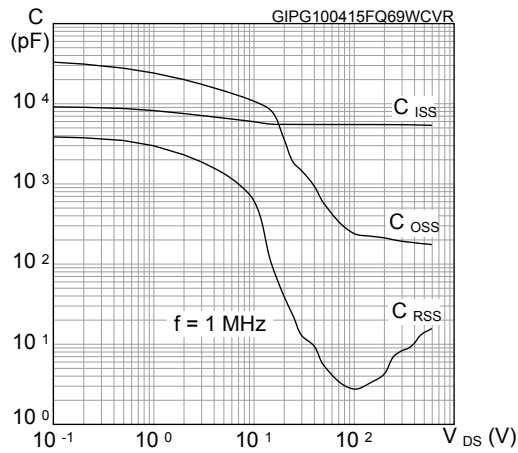
Figure 8. Normalized gate threshold vs temperature
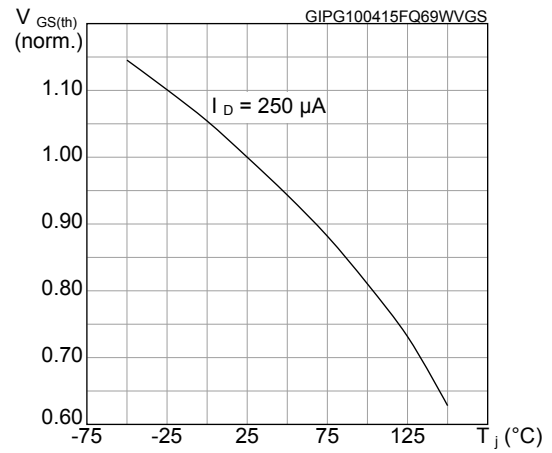
Figure 9. Normalized on-resistance vs temperature
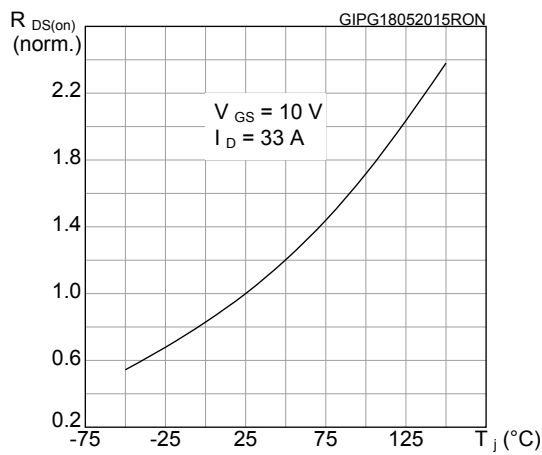
Figure 10. Normalized breakdown voltage vs temperature
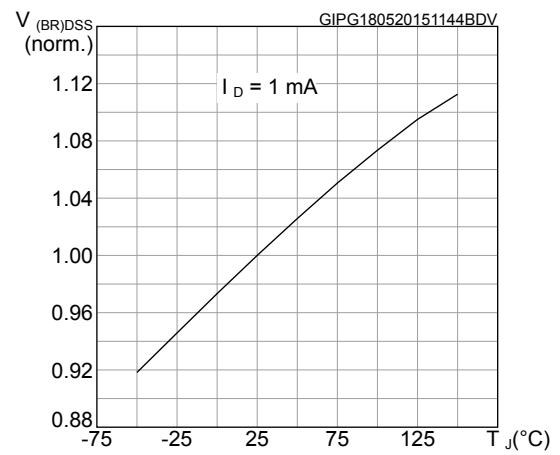
Figure 11. Typical output capacitance stored energy
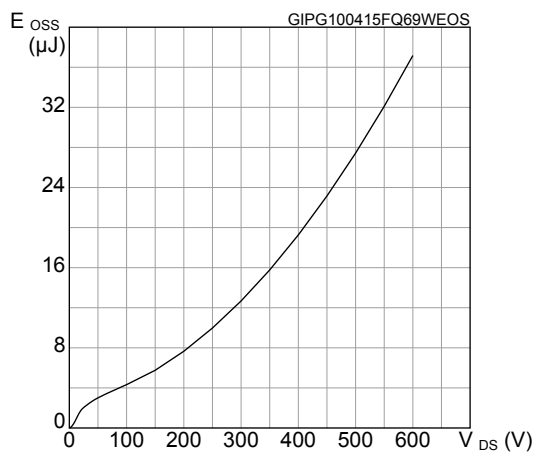
Figure 12. Typical reverse diode forward characteristics
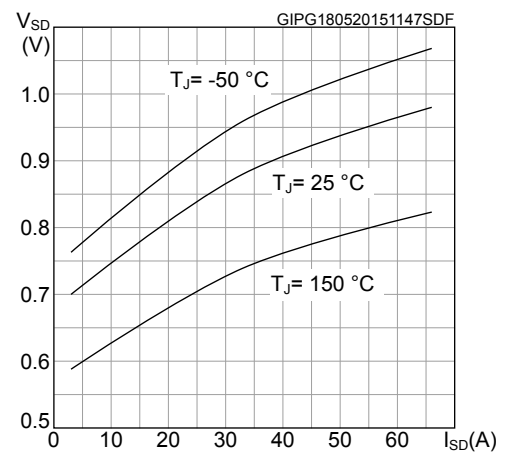
3 Test circuits

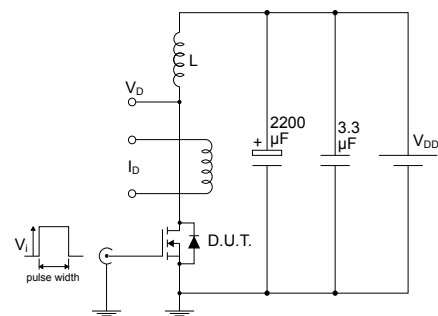**Figure 13. Test circuit for resistive load switching times**
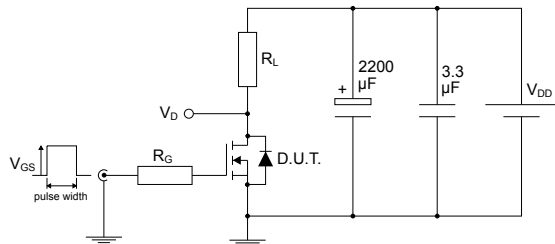
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Figure 14. Test circuit for gate charge behavior
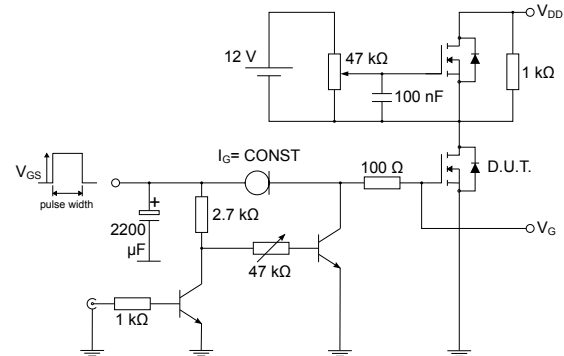
AM01469v1

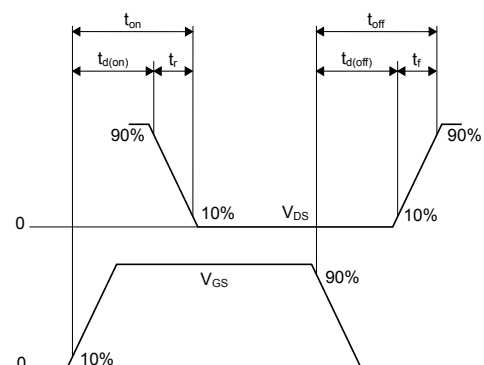**Figure 15. Test circuit for inductive load switching and diode recovery times**
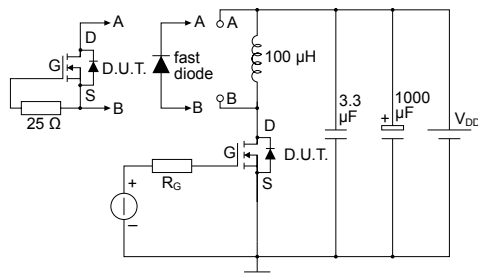
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Figure 16. Unclamped inductive load test circuit

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Figure 17. Unclamped inductive waveform
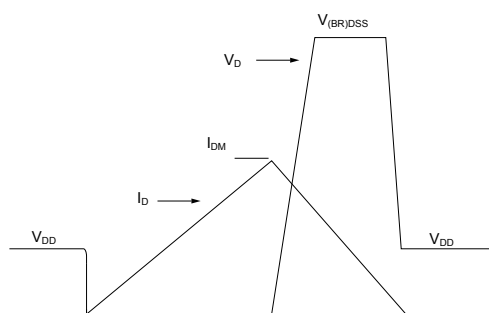

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Figure 18. Switching time waveform

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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-247 long leads package information

Figure 19. TO-247 long leads package outline
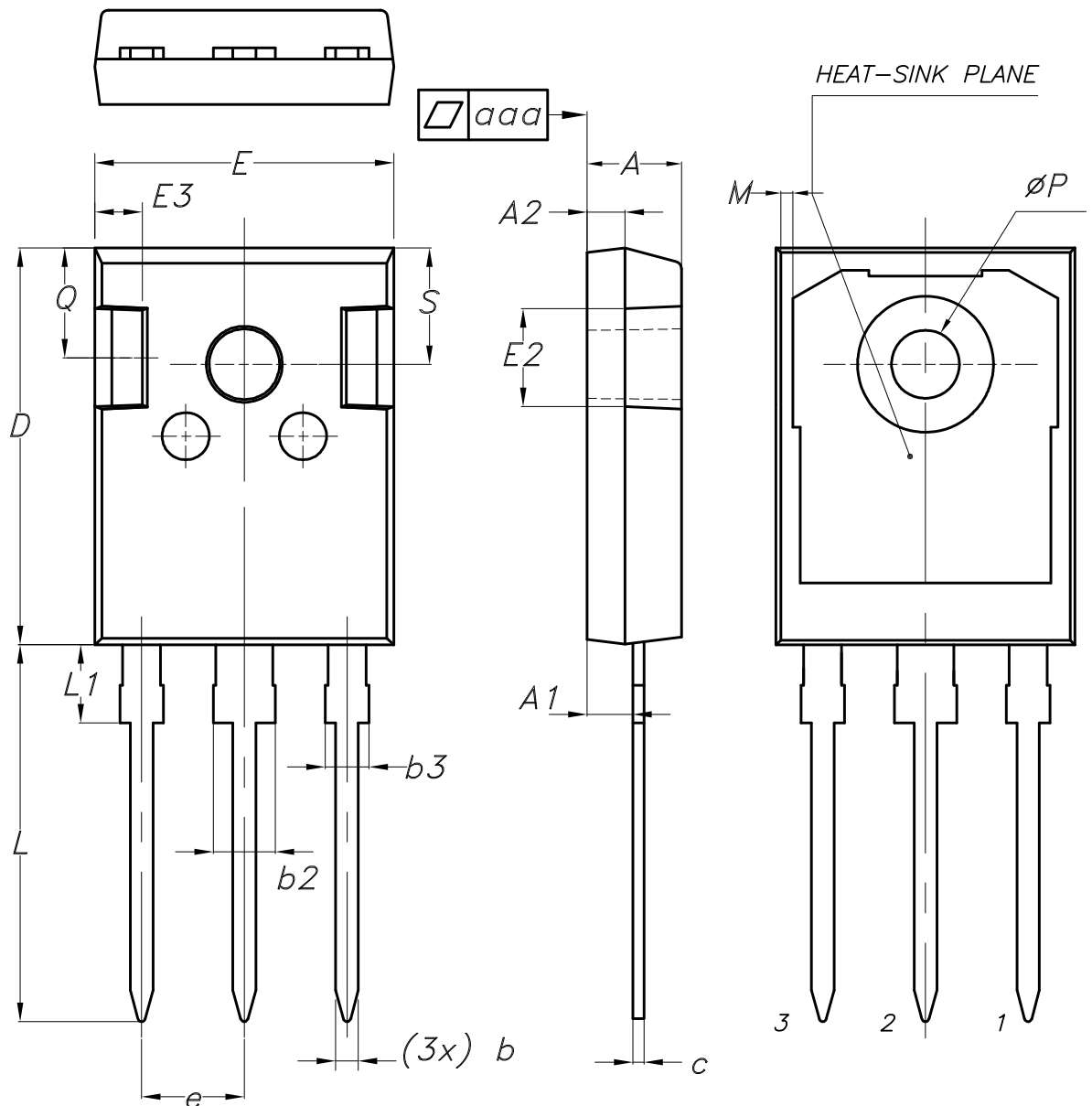
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Table 8. **TO-247 long leads package mechanical data**

Dim.	mm		
	Min.	Typ.	Max.
A	4.90	5.00	5.10
A1	2.31	2.41	2.51
A2	1.90	2.00	2.10
b	1.16		1.26
b2			3.25
b3			2.25
c	0.59		0.66
D	20.90	21.00	21.10
E	15.70	15.80	15.90
E2	4.90	5.00	5.10
E3	2.40	2.50	2.60
e	5.34	5.44	5.54
L	19.80	19.92	20.10
L1			4.30
M	0.35		0.95
P	3.50	3.60	3.70
Q	5.60		6.00
S	6.05	6.15	6.25
aaa		0.04	0.10

Revision history

Table 9. Document revision history

Date	Revision	Changes
19-May-2015	1	First release.
08-Jul-2015	2	Text and formatting changes throughout document Datasheet promoted from preliminary data to production data In Section *Electrical characteristics*: - updated Table *Dynamic* and *Source-drain diode*
19-Mar-2025	3	Updated Section 4.1: TO-247 long leads package information. Minor text changes.

Contents

IMPORTANT NOTICE – READ CAREFULLY