STP265N6F6AG, STW265N6F6AG

Automotive N-channel 60 V, 2.3 mΩ typ., 180 A STripFET™ F6 Power MOSFETs in TO-220 and TO-247 packages

Datasheet - production data

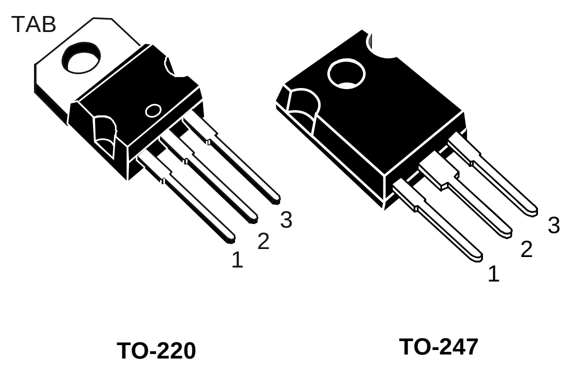
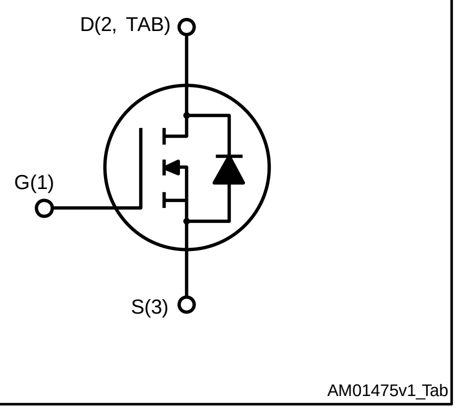


Figure 1: Internal schematic diagram



Features

Order code	V_{DS}	$R_{DS(on)}$ max	I_D
STP265N6F6AG	60 V	2.85 mΩ	180 A
STW265N6F6AG	60 V	2.85 mΩ	180 A

- Designed for automotive applications
- Very low on-resistance
- Very low gate charge
- High avalanche ruggedness
- Low gate drive power loss

Applications

- Switching applications

Description

These devices are N-channel Power MOSFETs developed using the STripFET™ F6 technology with a new trench gate structure. The resulting Power MOSFET exhibits very low $R_{DS(on)}$ in all packages.

Table 1: Device summary

Order code	Marking	Package	Packaging
STP265N6F6AG	265N6F6	TO-220	Tube
STW265N6F6AG	265N6F6	TO-247	Tube

Contents

1 Electrical ratings

Table 2: Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source voltage	60	V
V_{GS}	Gate-source voltage	± 20	V
I_D[(1)]	Drain current (continuous) at T_C = 25 °C	180	A
I_D[(1)]	Drain current (continuous) at T_C = 100 °C	180	A
I_{DM}[(2)]	Drain current (pulsed)	720	A
P_{TOT}	Total dissipation at T_C = 25 °C	300	W
E_{AS}	Single pulse avalanche energy (Starting T_J = 25 °C, I_D = 80 A)	720	mJ
	Derating factor	2	W/°C
T_{stg}	Storage temperature	- 55 to 175	°C
T_j	Operating junction temperature		

Notes:

(1)Current limited by package.

(2) Pulse width limited by safe operating area.

Table 3: Thermal data

Symbol	Parameter	Value		Unit
		TO-220	TO-247	
$R_{thj-case}$	Thermal resistance junction-case max	0.5		°C/W
$R_{thj-amb}$	Thermal resistance junction-amb max	62.5	50	°C/W

2 Electrical characteristics

(T_{CASE} = 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)	I_D = 250 µA	60			V
I_{DSS}	Zero gate voltage drain current (V_{GS} = 0)	V_{DS} = 60 V			1	µA
		V_{DS} = 60 V, T_C=125 °C			100	µA
I_{GSS}	Gate-body leakage current (V_{DS} = 0)	V_{GS} = ± 20 V			± 100	nA
$V_{GS(th)}$	Gate threshold voltage	V_{DS} = V_{GS}, I_D = 250 µA	2		4	V
$R_{DS(on)}$	Static drain-source on-resistance	V_{GS} = 10 V, I_D = 60 A		2.3	2.85	mΩ

Table 5: Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	V_{DS} = 25 V, f = 1 MHz, V_{GS} = 0	-	11800	-	pF
C_{oss}	Output capacitance		-	1235	-	pF
C_{rss}	Reverse transfer capacitance		-	488	-	pF
Q_g	Total gate charge	V_{DD} = 30 V, I_D = 120 A, V_{GS} = 10 V	-	183	-	nC
Q_{gs}	Gate-source charge		-	53	-	nC
Q_{gd}	Gate-drain charge		-	41	-	nC

Table 6: Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	V_{DD} = 30 V, I_D = 60 A R_G = 4.7 Ω, V_{GS} = 10 V	-	31	-	ns
t_r	Rise time		-	165	-	ns
$t_{d(off)}$	Turn-off-delay time		-	144	-	ns
t_f	Fall time		-	63	-	ns

Table 7: Source drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain current				180	A
I_{SDM} (1)	Source-drain current (pulsed)				720	A
V_{SD} (2)	Forward on voltage	I_{SD} = 180 A, V_{GS} = 0			1.1	V
t_{rr}	Reverse recovery time	I_{SD} = 120 A, V_{DD} = 48 V di/dt = 100 A/µs, T_j = 150 °C	-	56	-	ns
Q_{rr}	Reverse recovery charge		-	116	-	nC
I_{RRM}	Reverse recovery current		-	3.8	-	A

Notes:

(1) Pulse width limited by safe operating area.

(2) Pulsed: pulse duration = 300 µs, duty cycle 1.5%

2.2 Electrical characteristics (curves)

Figure 2: Safe operating area

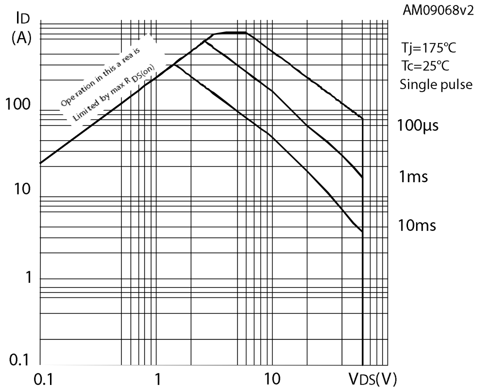


Figure 3: Thermal impedance

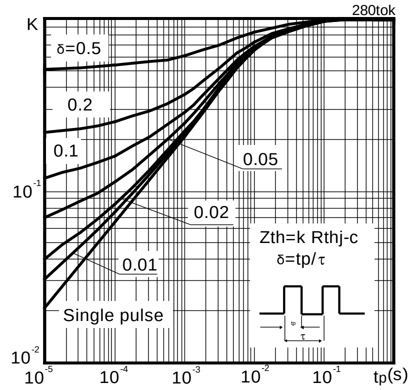


Figure 4: Output characteristics

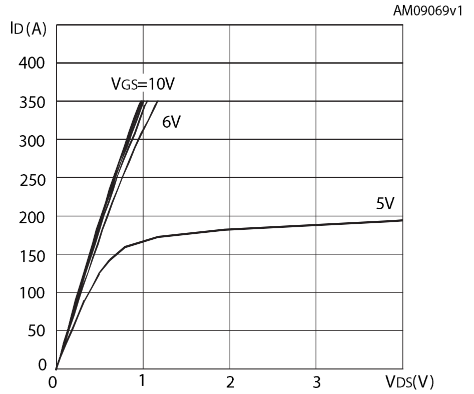


Figure 5: Transfer characteristics

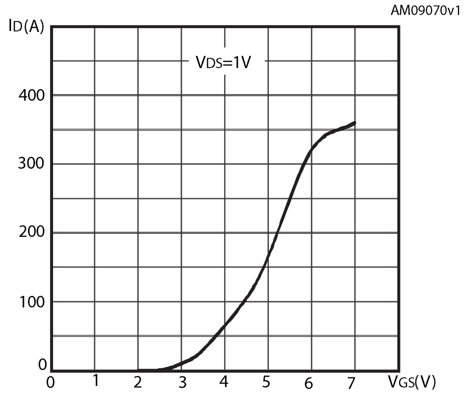


Figure 6: Normalized V(BR)DSS vs. temperature

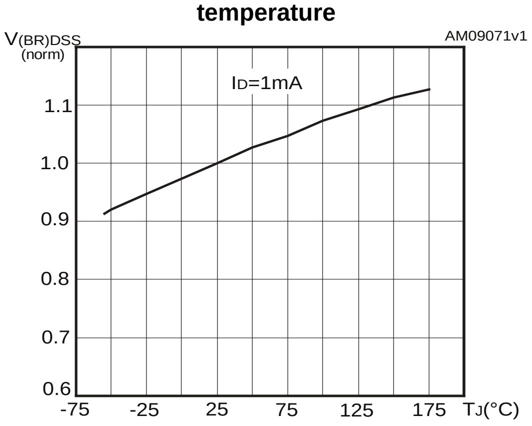


Figure 7: Static drain-source on resistance

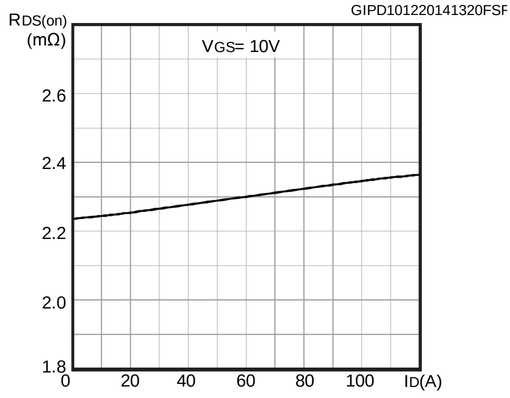


Figure 8: Gate charge vs. gate-source voltage

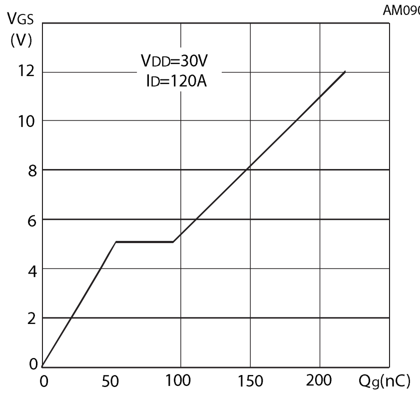


Figure 9: Capacitance variations

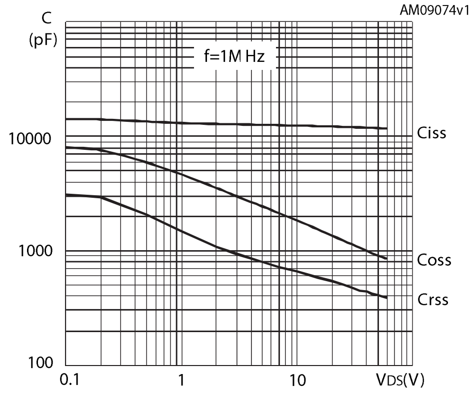


Figure 10: Normalized gate threshold voltage vs. temperature

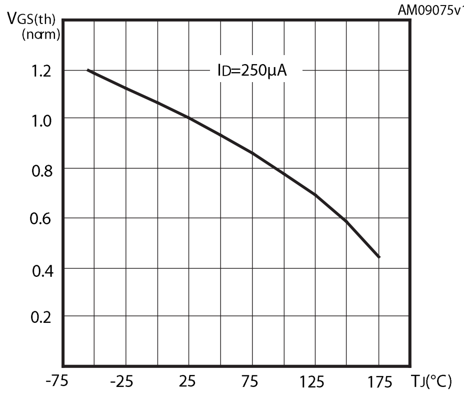


Figure 11: Normalized on resistance vs. temperature

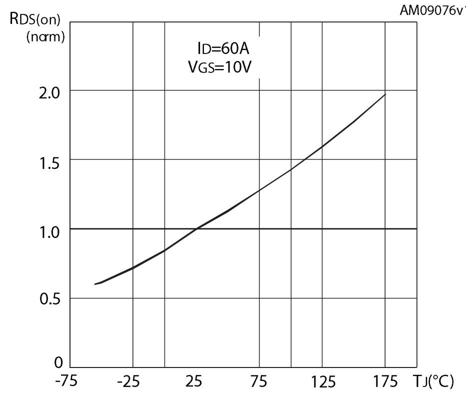
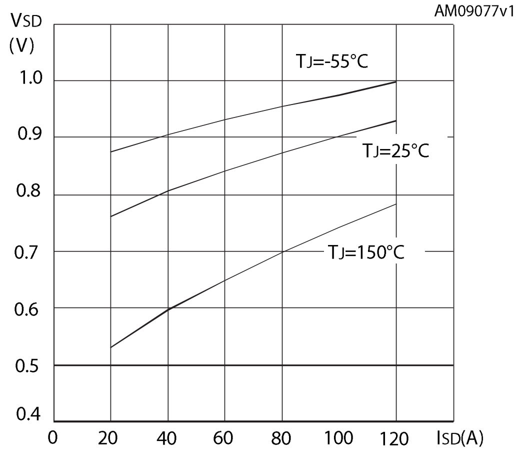


Figure 12: Source-drain diode forward characteristics



3 Test circuits

Figure 13: Switching times test circuit for resistive load

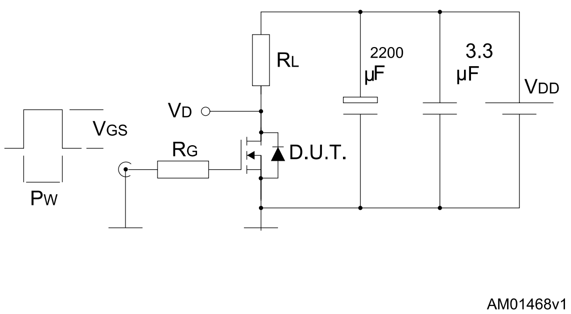


Figure 14: Gate charge test circuit

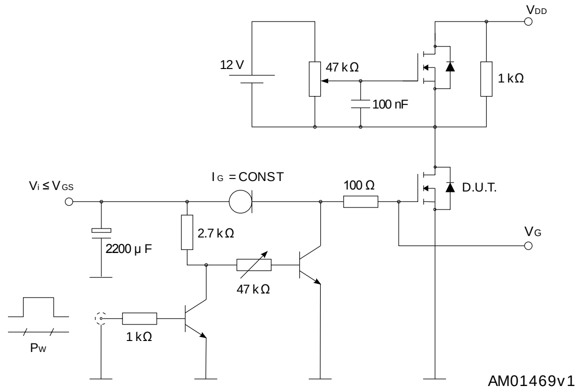


Figure 15: Test circuit for inductive load switching and diode recovery times

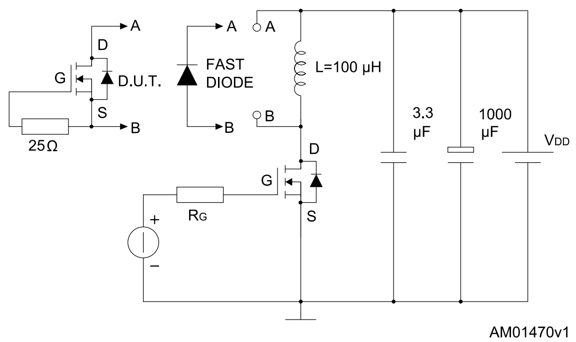


Figure 16: Unclamped inductive load test circuit

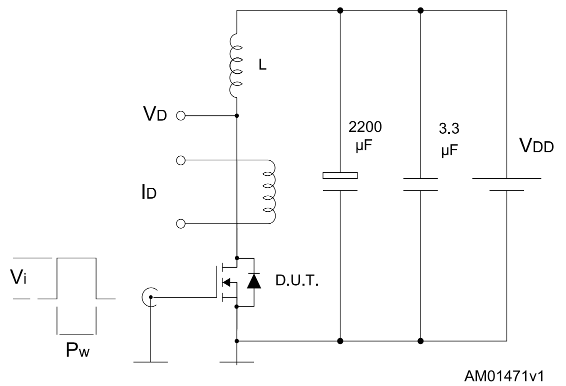


Figure 17: Unclamped inductive waveform

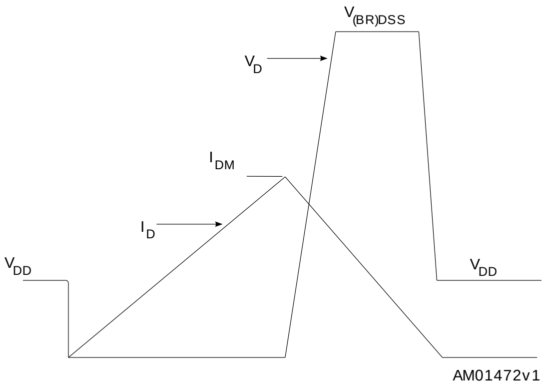
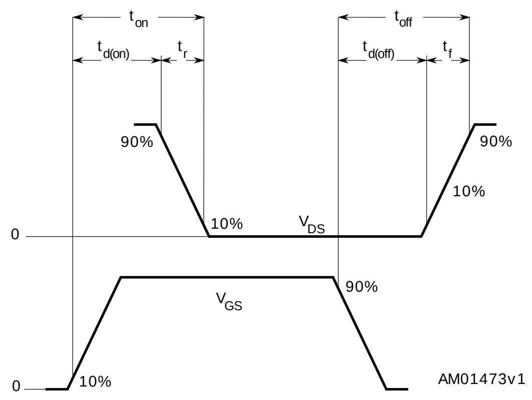


Figure 18: Switching time waveform



4 Package mechanical data

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 mechanical data

Figure 19: TO-220 type A package outline

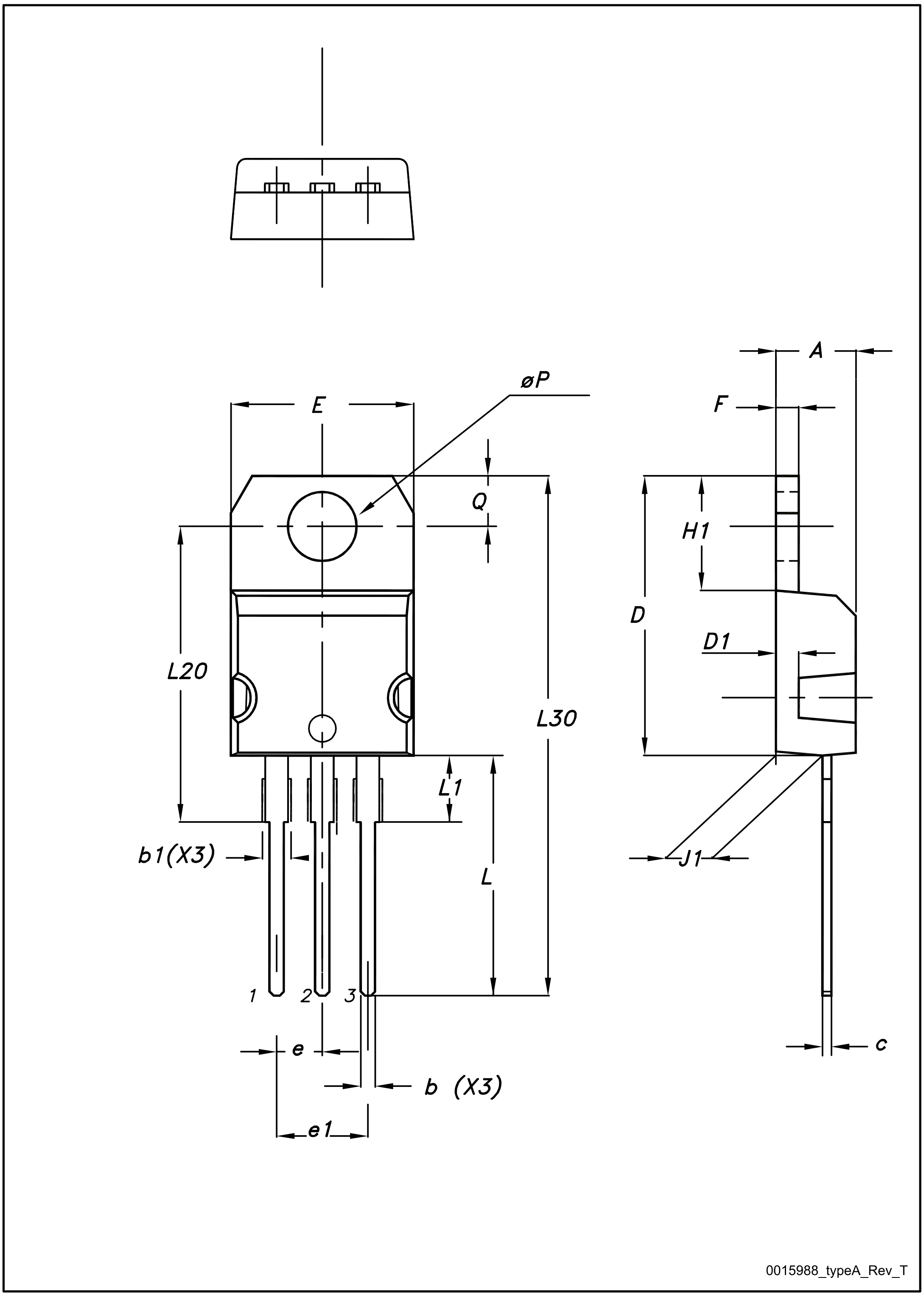


Table 8: TO-220 type A mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	4.40		4.60
b	0.61		0.88
b1	1.14		1.70
c	0.48		0.70
D	15.25		15.75
D1		1.27	
E	10		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		14
L1	3.50		3.93
L20		16.40	
L30		28.90	
øP	3.75		3.85
Q	2.65		2.95

4.2 TO-247 mechanical data

Figure 20: TO-247 drawing

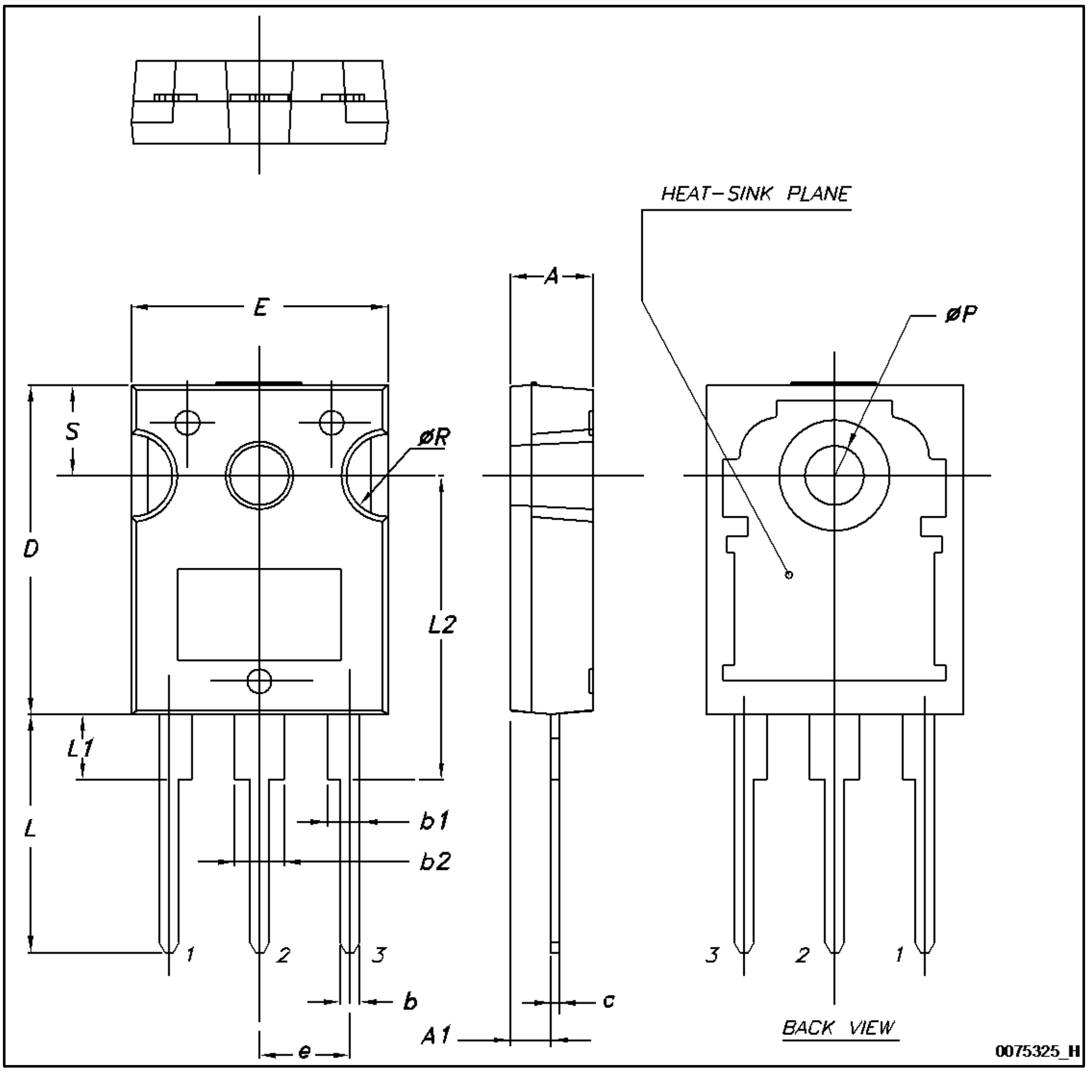


Table 9: TO-247 mechanical data

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

5 Revision history

Table 10: Document revision history

Date	Revision	Changes
10-Dec-2014	1	First release.
16-Dec-2014	2	Document status promoted from preliminary to production data.