



THE DATASHEET OF BSH205G2R





BSH205G2

20 V, P-channel Trench MOSFET

29 April 2015

Product data sheet

1. General description

P-channel enhancement mode Field-Effect Transistor (FET) in a small SOT23 (TO-236AB) Surface-Mounted Device (SMD) plastic package using Trench MOSFET technology.

2. Features and benefits

- Low threshold voltage
- Low on-state resistance
- Trench MOSFET technology
- Enhanced power dissipation capability of 890 mW
- AEC-Q101 qualified

3. Applications

- Relay driver
- High-speed line driver
- High-side loadswitch
- Switching circuits

4. Quick reference data

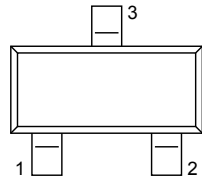
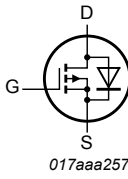
Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{DS}	drain-source voltage	$T_J = 25\text{ °C}$	-	-	-20	V
V_{GS}	gate-source voltage		-8	-	8	V
I_D	drain current	$V_{GS} = -4.5\text{ V}; T_{amb} = 25\text{ °C}; t \leq 5\text{ s}$	[1]	-	-2.3	A
Static characteristics						
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = -4.5\text{ V}; I_D = -2\text{ A}; T_J = 25\text{ °C}$	-	120	170	mΩ

[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for drain 6 cm².

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	G	gate	 <p>TO-236AB (SOT23)</p>	 <p>017aaa257</p>
2	S	source		
3	D	drain		

6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
BSH205G2	TO-236AB	plastic surface-mounted package; 3 leads	SOT23

7. Marking

Table 4. Marking codes

Type number	Marking code
BSH205G2	%KB

[1] % = placeholder for manufacturing site code

8. Limiting values

Table 5. Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions		Min	Max	Unit
V _{DS}	drain-source voltage	T _j = 25 °C		-	-20	V
V _{GS}	gate-source voltage			-8	8	V
I _D	drain current	V _{GS} = -4.5 V; T _{amb} = 25 °C; t ≤ 5 s	[1]	-	-2.3	A
		V _{GS} = -4.5 V; T _{amb} = 25 °C	[1]	-	-2	A
		V _{GS} = -4.5 V; T _{amb} = 100 °C	[1]	-	-1.2	A
I _{DM}	peak drain current	T _{amb} = 25 °C; single pulse; t _p ≤ 10 μs		-	-8	A
P _{tot}	total power dissipation	T _{amb} = 25 °C	[2]	-	480	mW
			[1]	-	890	mW
		T _{sp} = 25 °C		-	6250	mW
T _j	junction temperature			-55	150	°C
T _{amb}	ambient temperature			-55	150	°C
T _{stg}	storage temperature			-65	150	°C
Source-drain diode						
I _S	source current	T _{sp} = 25 °C	[1]	-	-0.8	A

[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for drain 6 cm².

[2] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated and standard footprint.

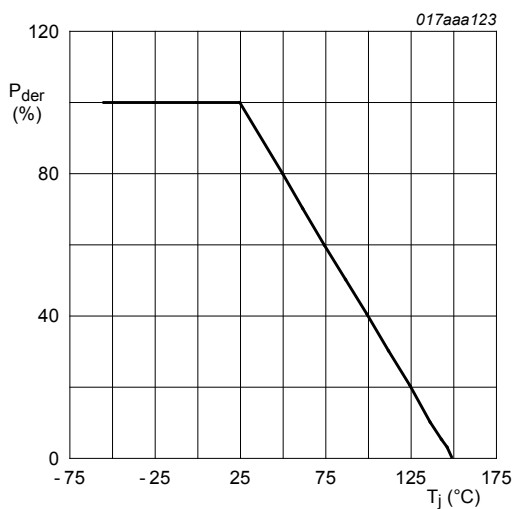


Fig. 1. Normalized total power dissipation as a function of junction temperature

$$P_{der} = \frac{P_{tot}}{P_{tot(25^{\circ}\text{C})}} \times 100 \%$$

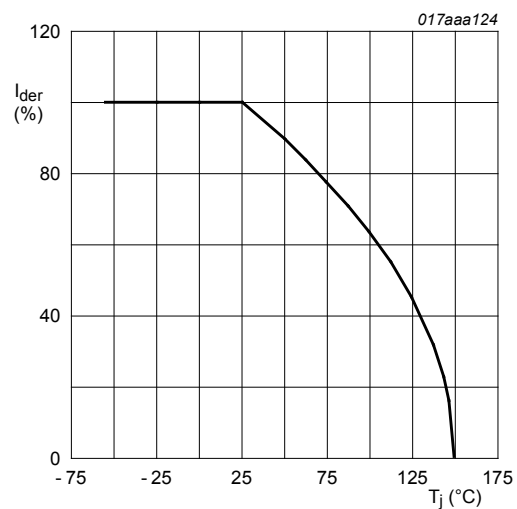
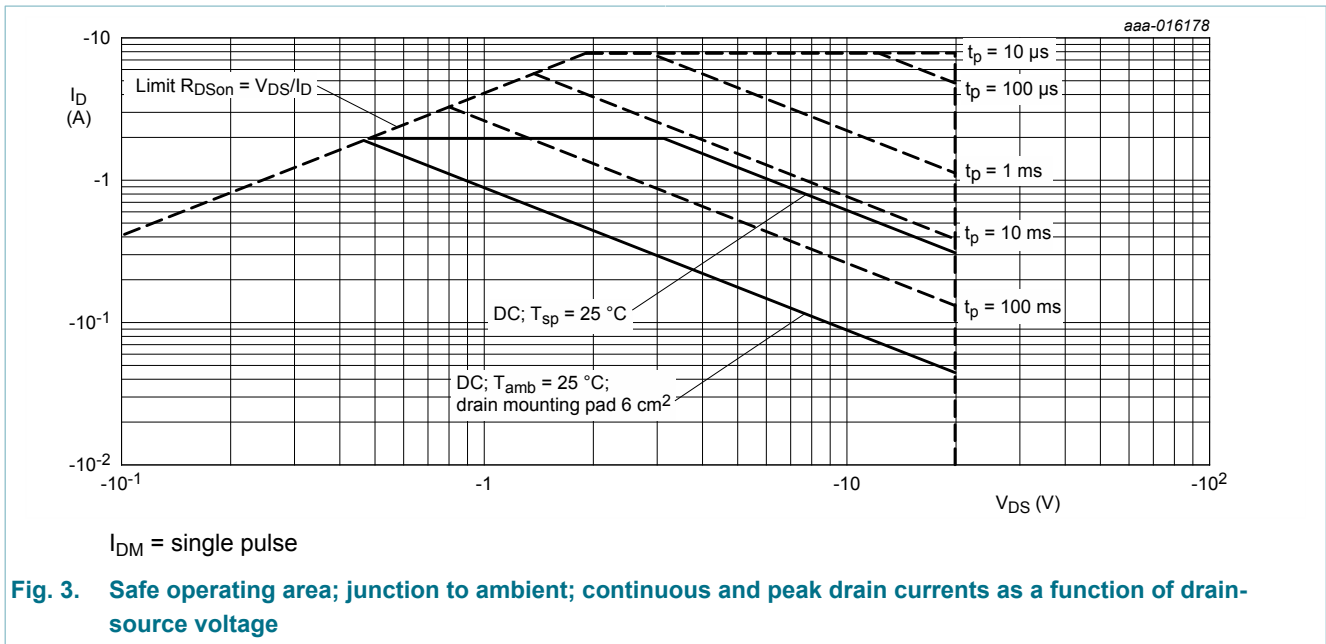


Fig. 2. Normalized continuous drain current as a function of junction temperature

$$I_{der} = \frac{I_D}{I_{D(25^{\circ}\text{C})}} \times 100 \%$$



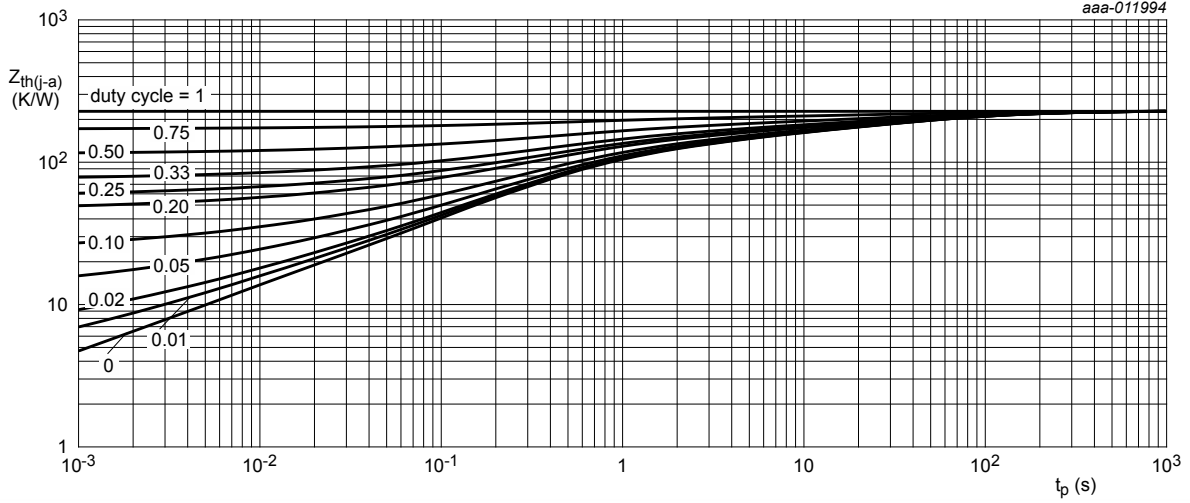
9. Thermal characteristics

Table 6. Thermal characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
R _{th(j-a)}	thermal resistance from junction to ambient	in free air	[1]	-	230	260	K/W
			[2]	-	120	140	K/W
		in free air; t ≤ 5 s	[2]	-	85	100	K/W
R _{th(j-sp)}	thermal resistance from junction to solder point			-	15	20	K/W

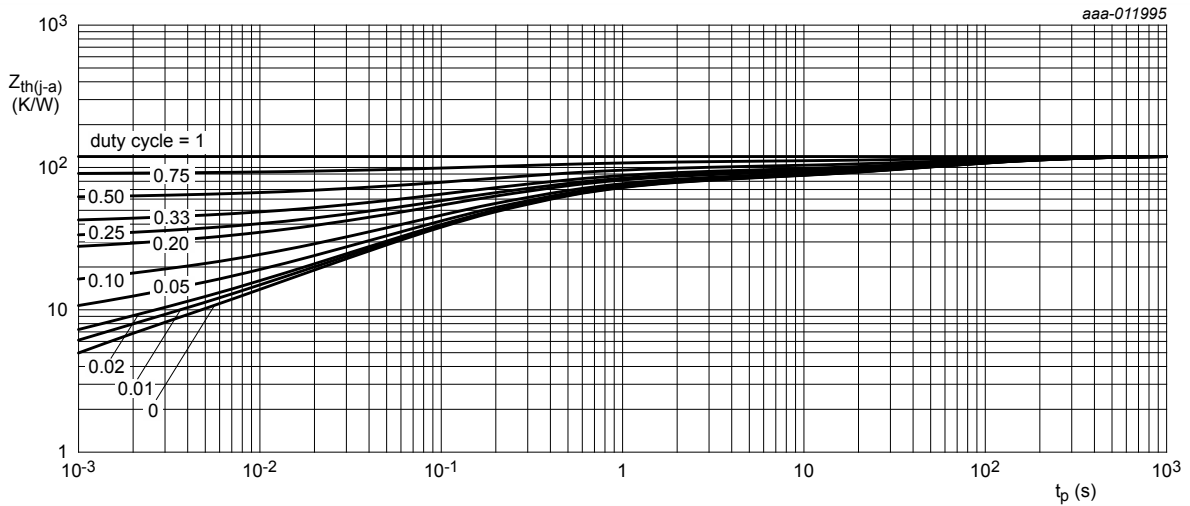
[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.

[2] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for drain 6 cm².



FR4 PCB, standard footprint

Fig. 4. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values



FR4 PCB, mounting pad for drain 6 cm²

Fig. 5. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

10. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
$V_{(BR)DSS}$	drain-source breakdown voltage	$I_D = -250 \mu A$; $V_{GS} = 0 V$; $T_j = 25 \text{ }^\circ C$	-20	-	-	V
V_{GSth}	gate-source threshold voltage	$I_D = -250 \mu A$; $V_{DS} = V_{GS}$; $T_j = 25 \text{ }^\circ C$	-0.45	-0.7	-0.95	V
I_{DSS}	drain leakage current	$V_{DS} = -20 V$; $V_{GS} = 0 V$; $T_j = 25 \text{ }^\circ C$	-	-	-1	μA
I_{GSS}	gate leakage current	$V_{GS} = 8 V$; $V_{DS} = 0 V$; $T_j = 25 \text{ }^\circ C$	-	-	100	nA
		$V_{GS} = -8 V$; $V_{DS} = 0 V$; $T_j = 25 \text{ }^\circ C$	-	-	-100	nA
R_{DSon}	drain-source on-state resistance	$V_{GS} = -4.5 V$; $I_D = -2 A$; $T_j = 25 \text{ }^\circ C$	-	120	170	m Ω
		$V_{GS} = -4.5 V$; $I_D = -2 A$; $T_j = 150 \text{ }^\circ C$	-	168	238	m Ω
		$V_{GS} = -2.5 V$; $I_D = -1.5 A$; $T_j = 25 \text{ }^\circ C$	-	150	230	m Ω
		$V_{GS} = -1.8 V$; $I_D = -0.6 A$; $T_j = 25 \text{ }^\circ C$	-	200	320	m Ω
		$V_{GS} = -1.5 V$; $I_D = -0.1 A$; $T_j = 25 \text{ }^\circ C$	-	260	600	m Ω
g_{fs}	forward transconductance	$V_{DS} = -10 V$; $I_D = -2 A$; $T_j = 25 \text{ }^\circ C$	-	4.5	-	S
Dynamic characteristics						
$Q_{G(tot)}$	total gate charge	$V_{DS} = -10 V$; $I_D = -2 A$; $V_{GS} = -4.5 V$; $T_j = 25 \text{ }^\circ C$	-	3.7	6.5	nC
Q_{GS}	gate-source charge		-	0.6	-	nC
Q_{GD}	gate-drain charge		-	0.8	-	nC
C_{iss}	input capacitance	$V_{DS} = -10 V$; $f = 1 \text{ MHz}$; $V_{GS} = 0 V$; $T_j = 25 \text{ }^\circ C$	-	418	-	pF
C_{oss}	output capacitance		-	45	-	pF
C_{rss}	reverse transfer capacitance		-	34	-	pF
$t_{d(on)}$	turn-on delay time	$V_{DS} = -10 V$; $I_D = -2 A$; $V_{GS} = -4.5 V$; $R_{G(ext)} = 6 \Omega$; $T_j = 25 \text{ }^\circ C$	-	5	-	ns
t_r	rise time		-	14	-	ns
$t_{d(off)}$	turn-off delay time		-	43	-	ns
t_f	fall time		-	16	-	ns
Source-drain diode						
V_{SD}	source-drain voltage	$I_S = -0.8 A$; $V_{GS} = 0 V$; $T_j = 25 \text{ }^\circ C$	-	-0.8	-1.2	V

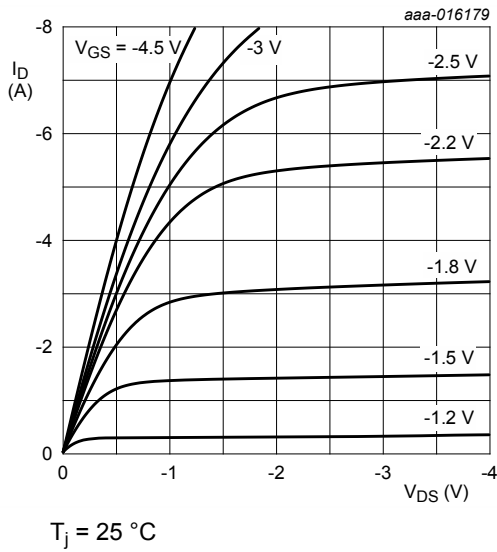


Fig. 6. Output characteristics: drain current as a function of drain-source voltage; typical values

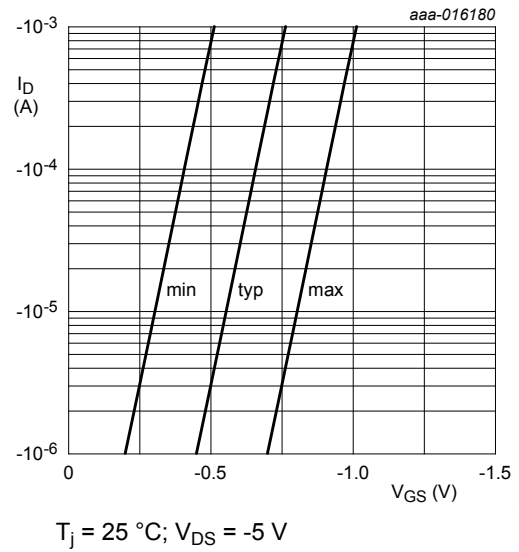


Fig. 7. Sub-threshold drain current as a function of gate-source voltage

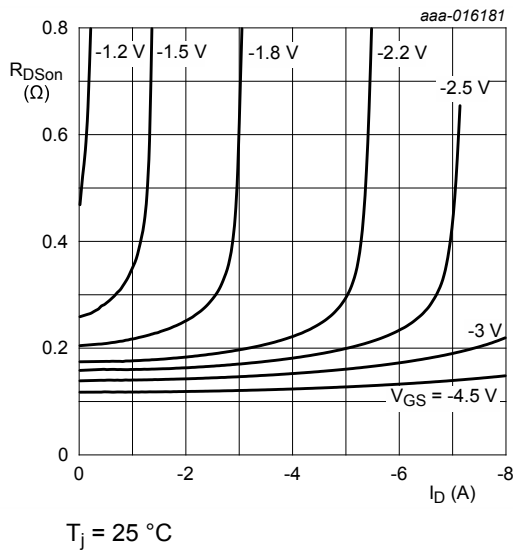


Fig. 8. Drain-source on-state resistance as a function of drain current; typical values

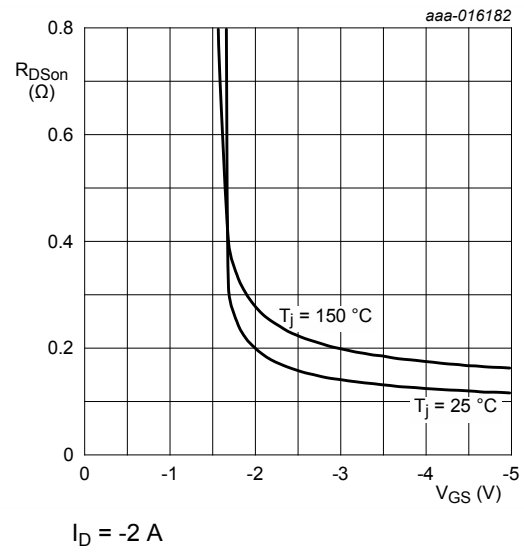


Fig. 9. Drain-source on-state resistance as a function of gate-source voltage; typical values

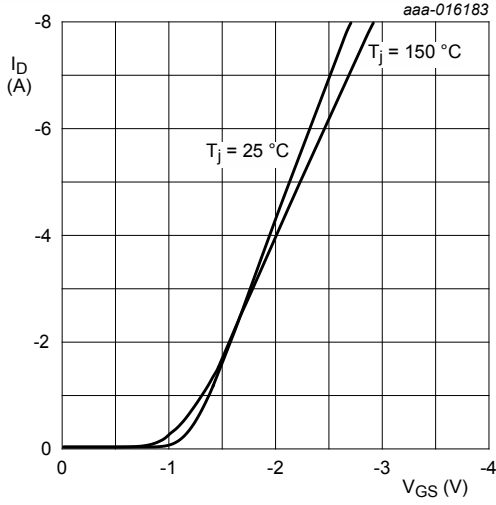


Fig. 10. Transfer characteristics: drain current as a function of gate-source voltage; typical values

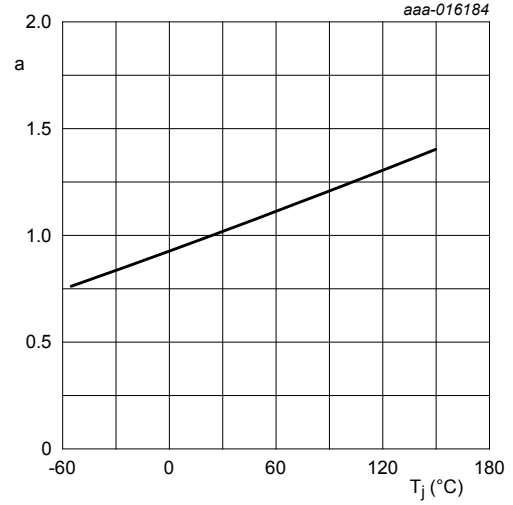


Fig. 11. Normalized drain-source on-state resistance as a function of junction temperature; typical values

$$a = \frac{R_{DSon}}{R_{DSon(25\text{°C})}}$$

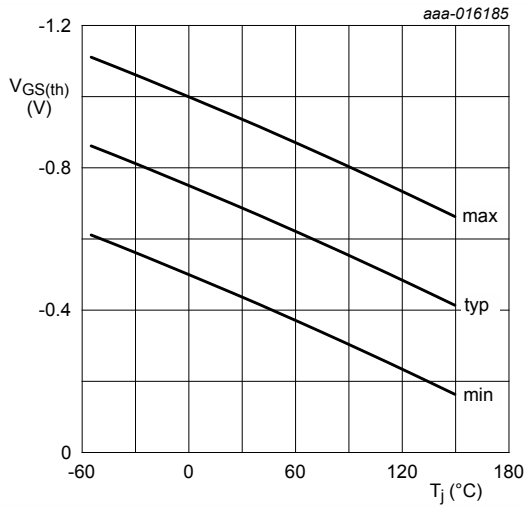


Fig. 12. Gate-source threshold voltage as a function of junction temperature

$I_D = -0.25\text{ mA}; V_{DS} = V_{GS}$

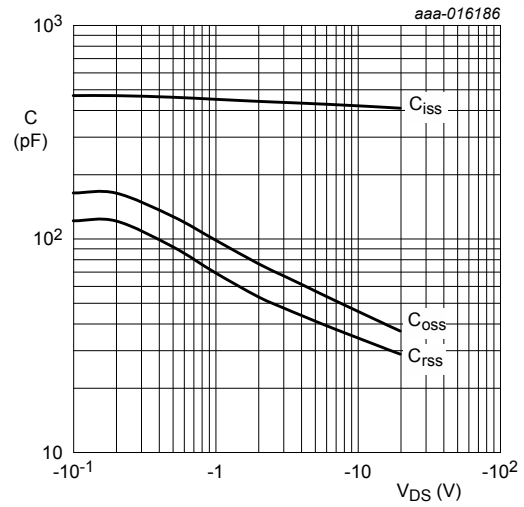
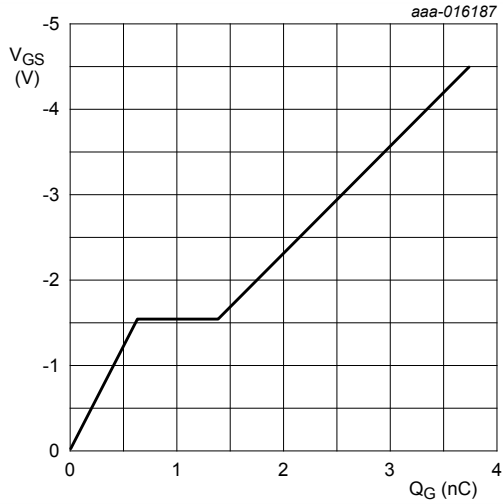


Fig. 13. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values

$f = 1\text{ MHz}; V_{GS} = 0\text{ V}$



$I_D = -2 \text{ A}; V_{DS} = -10 \text{ V}; T_{amb} = 25 \text{ }^\circ\text{C}$

Fig. 14. Gate-source voltage as a function of gate charge; typical values

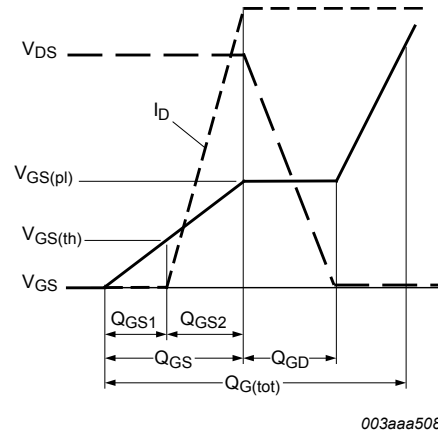
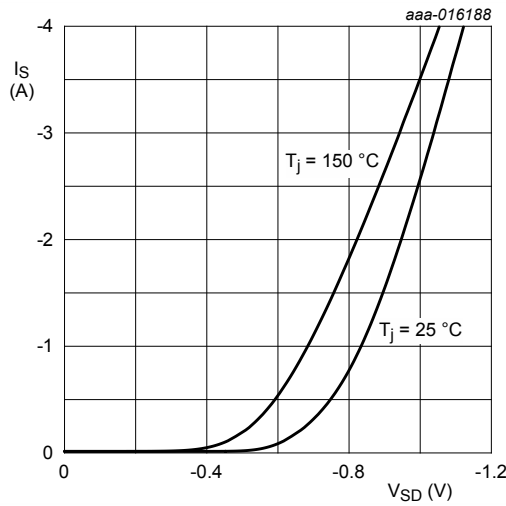


Fig. 15. MOSFET transistor: Gate charge waveform definitions



$V_{GS} = 0 \text{ V}$

Fig. 16. Source current as a function of source-drain voltage; typical values

11. Test information

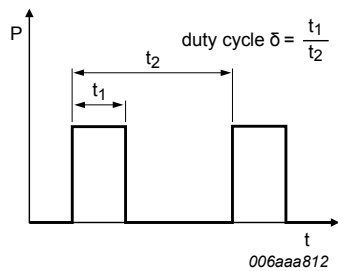


Fig. 17. Duty cycle definition

11.1 Quality information

This product has been qualified in accordance with the Automotive Electronics Council (AEC) standard Q101 - Stress test qualification for discrete semiconductors, and is suitable for use in automotive applications.

12. Package outline

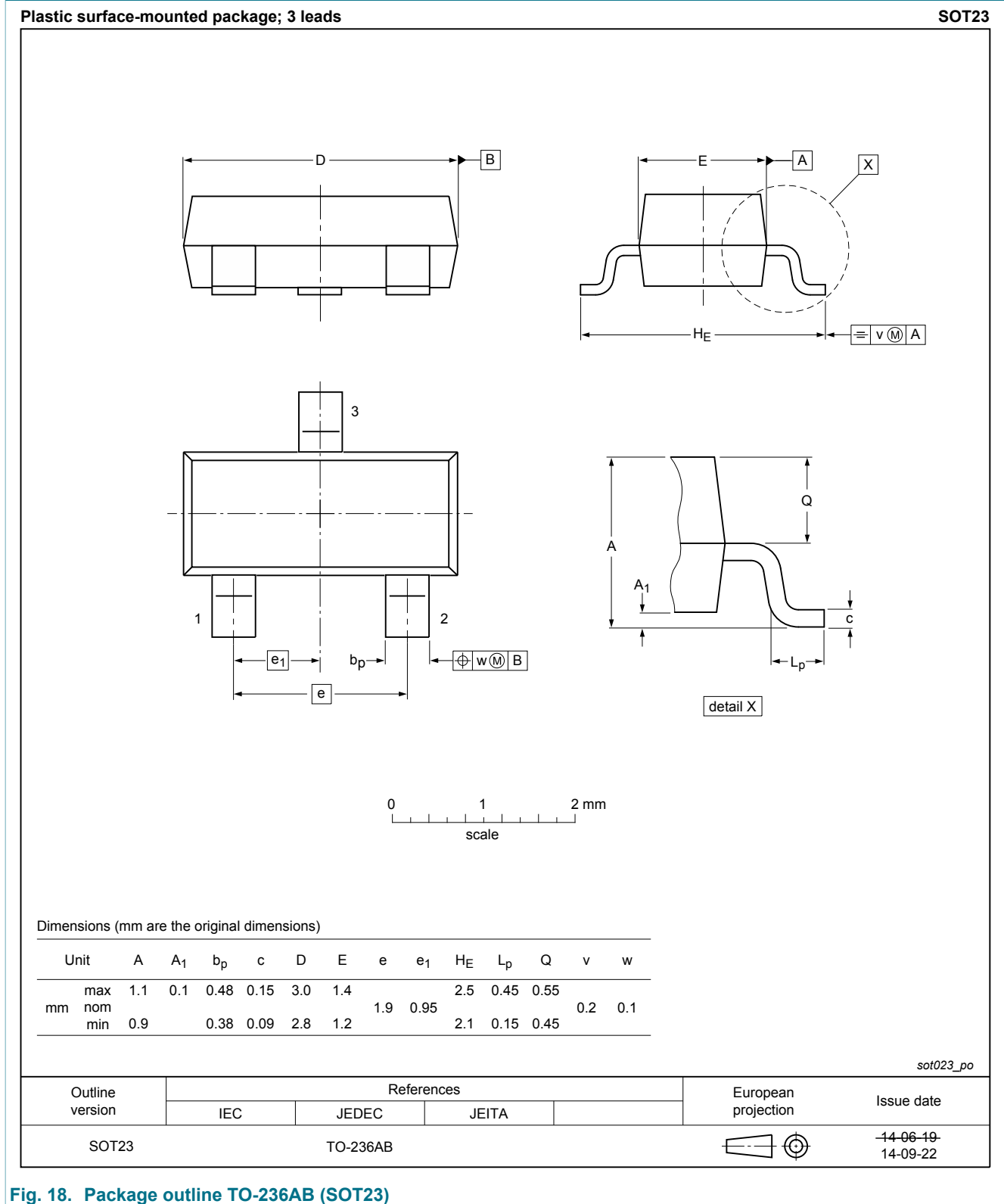


Fig. 18. Package outline TO-236AB (SOT23)

13. Soldering



Fig. 19. Reflow soldering footprint for TO-236AB (SOT23)



Fig. 20. Wave soldering footprint for TO-236AB (SOT23)

14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
BSH205G2 v. 2	20150429	Product data sheet	-	BSH205G2 v.1
Modifications:	<ul style="list-style-type: none">AEC-Q101 qualified			
BSH205G2 v.1	20141215	Product data sheet	-	-

15. Legal information

15.1 Data sheet status

Document status [1][2]	Product status [3]	Definition
Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
Preliminary [short] data sheet	Qualification	This document contains data from the preliminary specification.
Product [short] data sheet	Production	This document contains the product specification.

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