



PMV65UNEA

20 V, N-channel Trench MOSFET

17 March 2017

Product data sheet

1. General description

N-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

- Trench MOSFET technology
- Low threshold voltage
- Enhanced power dissipation capability of 940 mW
- ElectroStatic Discharge (ESD) protection > 2KV HBM
- AEC-Q101 qualified

3. Applications

- LED driver
- Power management
- Low-side loadswitch
- Switching circuits

4. Quick reference data

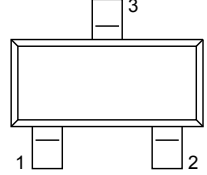
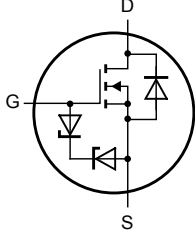
Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{DS}	drain-source voltage	$T_j = 25\text{ °C}$	-	-	20	V
V_{GS}	gate-source voltage	$T_j = 25\text{ °C}; T_{amb} = 25\text{ °C}$	-8	-	8	V
I_D	drain current	$V_{GS} = 4.5\text{ V}; T_{amb} = 25\text{ °C}$	[1]	-	2.8	A
Static characteristics						
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = 4.5\text{ V}; I_D = 2.8\text{ A}; T_j = 25\text{ °C}$	-	63	73	mΩ

[1] Device mounted on an FR4 Printed-Circuit Board (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>017aaa255</p>
2	S	source		
3	D	drain		

6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PMV65UNEA	TO-236AB	plastic surface-mounted package; 3 leads	SOT23

7. Marking

Table 4. Marking codes

Type number	Marking code ^[1]
PMV65UNEA	EM%

[1] % = placeholder for manufacturing site code

8. Limiting values

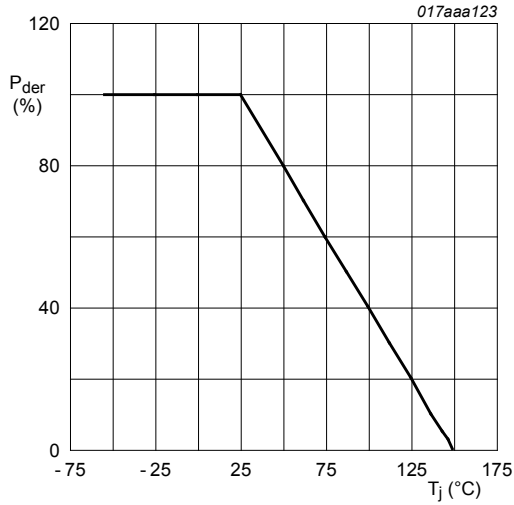
Table 5. Limiting values

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

Symbol	Parameter	Conditions		Min	Max	Unit
V_{DS}	drain-source voltage	$T_j = 25\text{ °C}$		-	20	V
V_{GS}	gate-source voltage	$T_j = 25\text{ °C}; T_{amb} = 25\text{ °C}$		-8	8	V
I_D	drain current	$V_{GS} = 4.5\text{ V}; T_{amb} = 25\text{ °C}$	[1]	-	2.8	A
		$V_{GS} = 4.5\text{ V}; T_{amb} = 100\text{ °C}$	[1]	-	1.8	A
I_{DM}	peak drain current	$T_{amb} = 25\text{ °C};$ single pulse; $t_p \leq 10\text{ }\mu\text{s}$		-	11	A
$E_{DS(AL)S}$	non-repetitive drain-source avalanche energy	$T_{j(\text{init})} = 25\text{ °C}; I_D = 0.3\text{ A};$ DUT in avalanche (unclamped)		-	5.6	mJ
P_{tot}	total power dissipation	$T_{amb} = 25\text{ °C}$	[2]	-	490	mW
			[1]	-	940	mW
		$T_{sp} = 25\text{ °C}$		-	6.25	W
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	$T_{amb} = 25\text{ °C}$	[1]	-	0.9	A
ESD Maximum rating						
V_{ESD}	electrostatic discharge voltage	HBM		-	2000	V

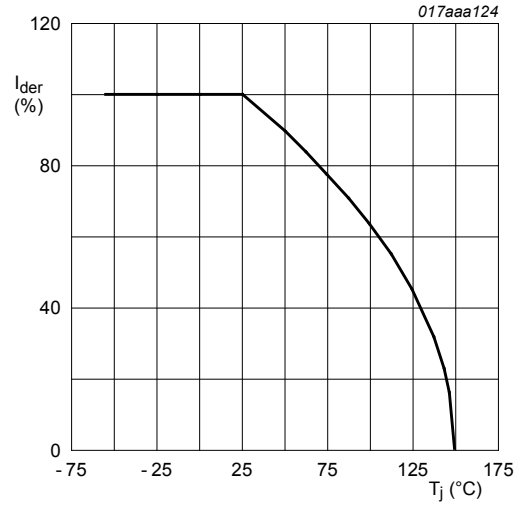
[1] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated, mounting pad for drain 6 cm².

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



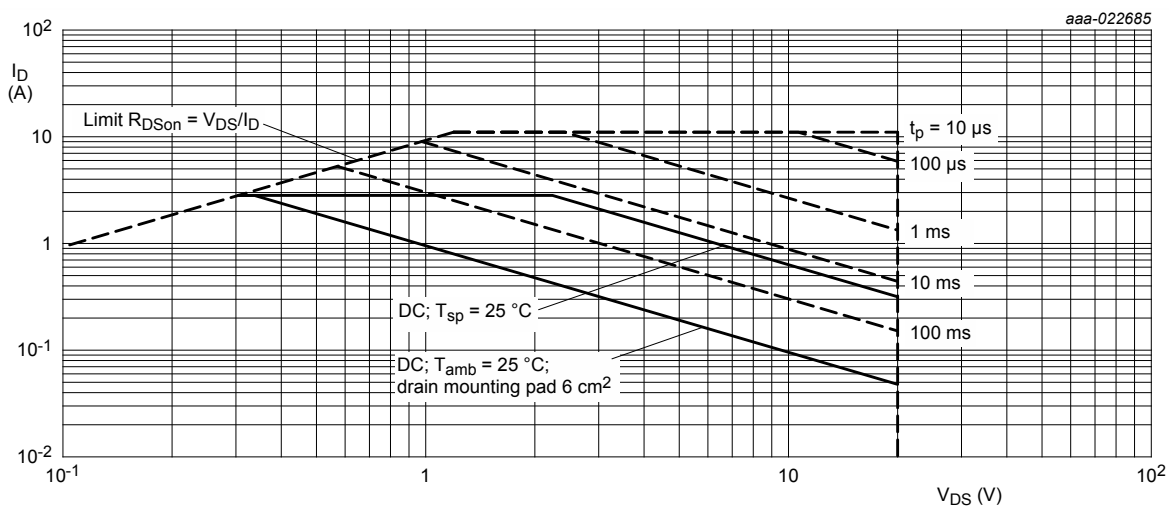
$$P_{der} = \frac{P_{tot}}{P_{tot(25^\circ\text{C})}} \times 100 \%$$

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



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

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



I_{DM} = single pulse

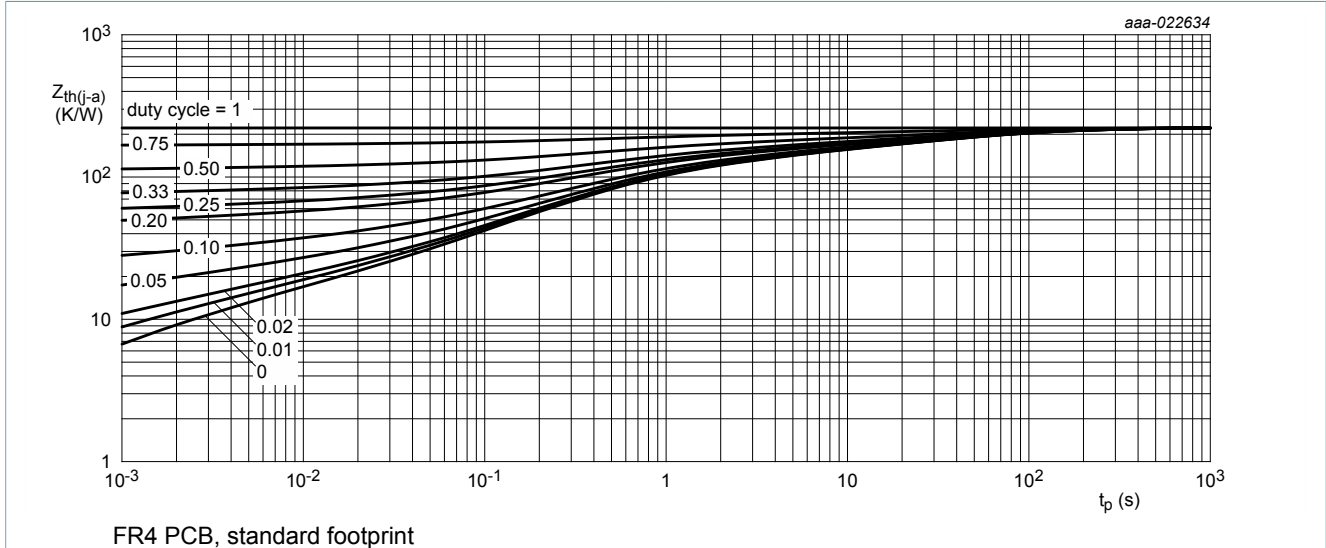
Fig. 3. Safe operating area; junction to ambient; continuous and peak drain currents as a function of drain-source voltage

9. Thermal characteristics

Table 6. Thermal characteristics

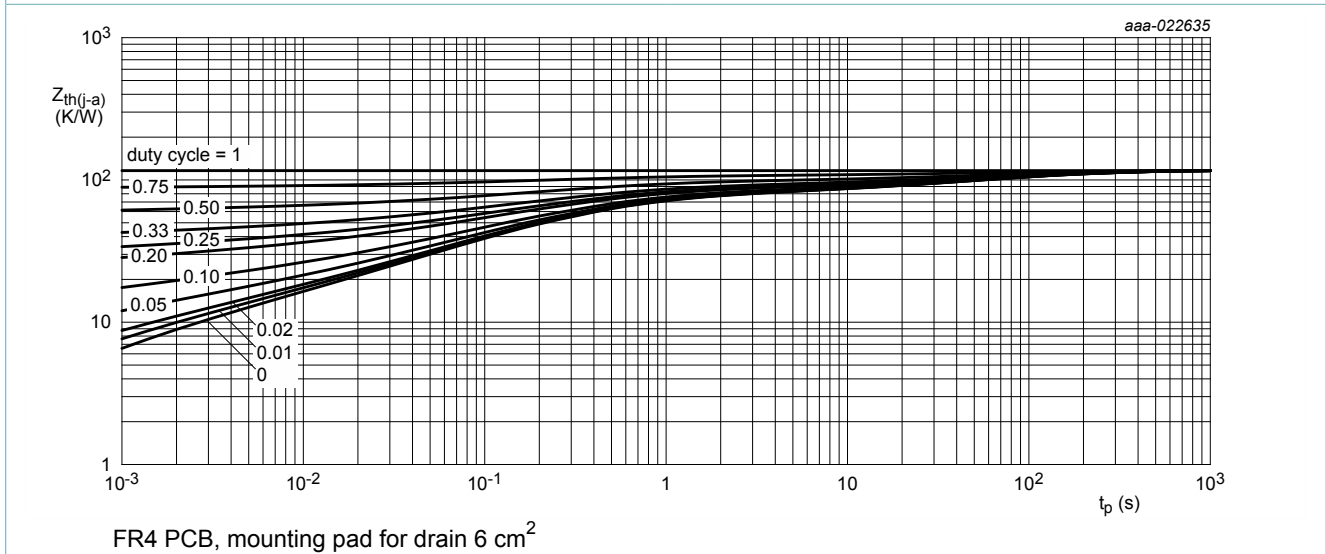
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1]	-	221	254	K/W
			[2]	-	116	133	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point			-	17	20	K/W

- [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	1	V
I_{DSS}	drain leakage current	$V_{DS} = 20 V$; $V_{GS} = 0 V$	-	-	1	μA
I_{GSS}	gate leakage current	$V_{GS} = 8 V$; $V_{DS} = 0 V$; $T_j = 25 \text{ }^\circ C$	-	-	10	μA
		$V_{GS} = -8 V$; $V_{DS} = 0 V$; $T_j = 25 \text{ }^\circ C$	-	-	-10	μA
		$V_{GS} = 4.5 V$; $V_{DS} = 0 V$; $T_j = 25 \text{ }^\circ C$	-	-	5	μA
		$V_{GS} = -4.5 V$; $V_{DS} = 0 V$; $T_j = 25 \text{ }^\circ C$	-	-	-5	μA
R_{DSon}	drain-source on-state resistance	$V_{GS} = 4.5 V$; $I_D = 2.8 A$; $T_j = 25 \text{ }^\circ C$	-	63	73	m Ω
		$V_{GS} = 4.5 V$; $I_D = 2.8 A$; $T_j = 150 \text{ }^\circ C$	-	93	108	m Ω
		$V_{GS} = 2.5 V$; $I_D = 2.4 A$; $T_j = 25 \text{ }^\circ C$	-	71	83	m Ω
		$V_{GS} = 1.8 V$; $I_D = 0.8 A$; $T_j = 25 \text{ }^\circ C$	-	83	94	m Ω
g_{fs}	forward transconductance	$V_{DS} = 10 V$; $I_D = 3 A$; $T_j = 25 \text{ }^\circ C$	-	11	-	S
R_G	gate resistance	$T_j = 25 \text{ }^\circ C$; $f = 1 \text{ MHz}$	-	1.8	-	Ω
Dynamic characteristics						
$Q_{G(tot)}$	total gate charge	$V_{DS} = 10 V$; $I_D = 2.8 A$; $V_{GS} = 4.5 V$; $T_j = 25 \text{ }^\circ C$	-	3.8	6	nC
Q_{GS}	gate-source charge		-	0.3	-	nC
Q_{GD}	gate-drain charge		-	0.9	-	nC
C_{iss}	input capacitance	$V_{DS} = 10 V$; $f = 1 \text{ MHz}$; $V_{GS} = 0 V$; $T_j = 25 \text{ }^\circ C$	-	291	-	pF
C_{oss}	output capacitance		-	52	-	pF
C_{rss}	reverse transfer capacitance		-	43	-	pF
$t_{d(on)}$	turn-on delay time		$V_{DS} = 10 V$; $I_D = 2.8 A$; $V_{GS} = 4.5 V$; $R_{G(ext)} = 6 \text{ } \Omega$; $T_j = 25 \text{ }^\circ C$	-	8	-
t_r	rise time	-		23	-	ns
$t_{d(off)}$	turn-off delay time	-		35	-	ns
t_f	fall time	-		12	-	ns
Source-drain diode						
V_{SD}	source-drain voltage	$I_S = 0.9 A$; $V_{GS} = 0 V$; $T_j = 25 \text{ }^\circ C$	-	0.7	1.2	V

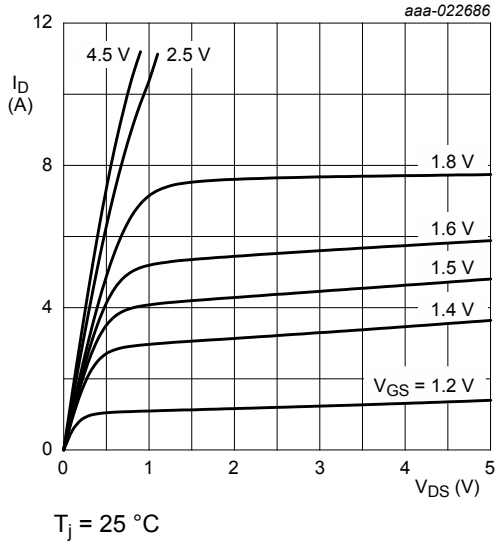


Fig. 6. Output characteristics: drain current as a function of drain-source voltage; typical values

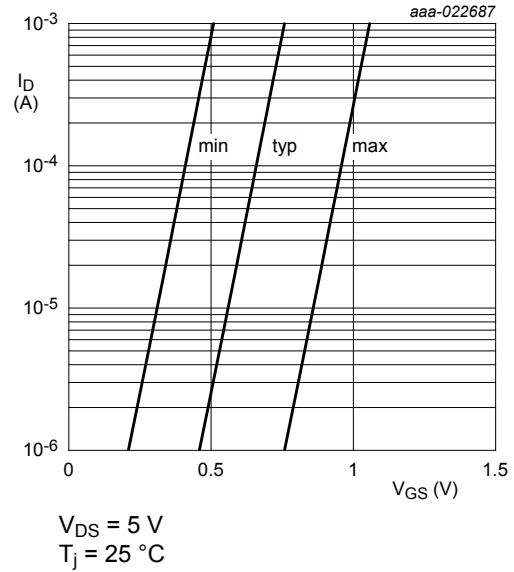


Fig. 7. Sub-threshold drain current as a function of gate-source voltage

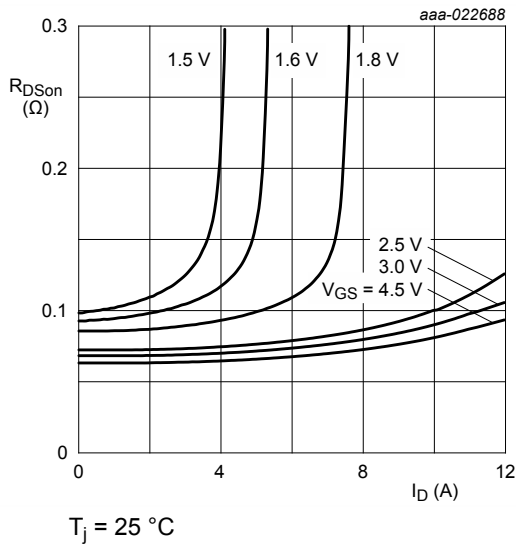


Fig. 8. Drain-source on-state resistance as a function of drain current; typical values

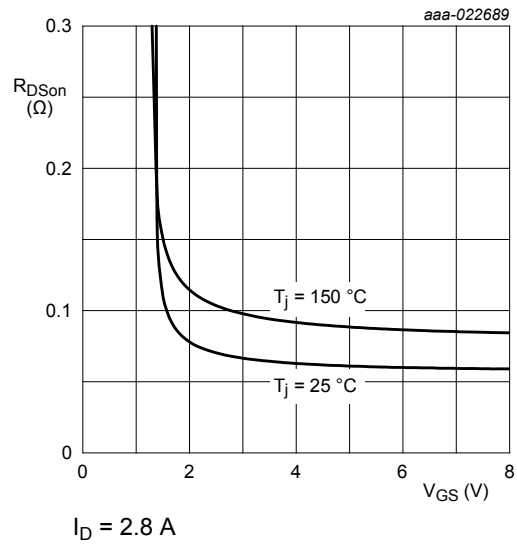
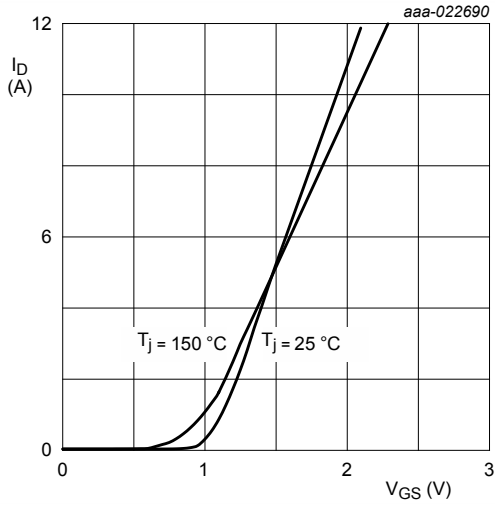
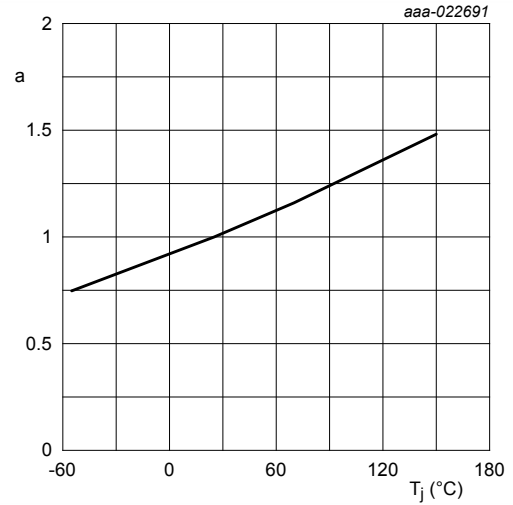


Fig. 9. Drain-source on-state resistance as a function of gate-source voltage; typical values



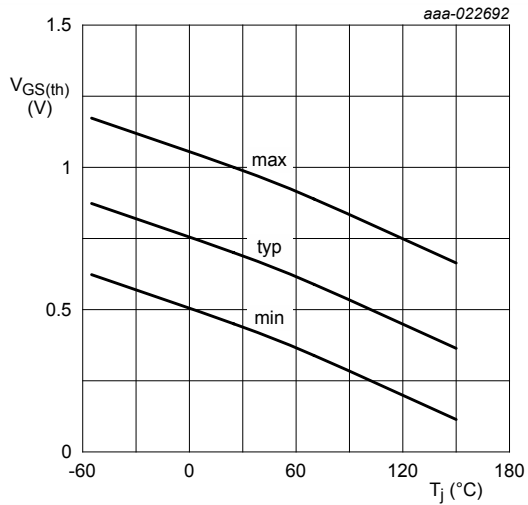
$$V_{DS} > I_D \times R_{DSon}$$

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



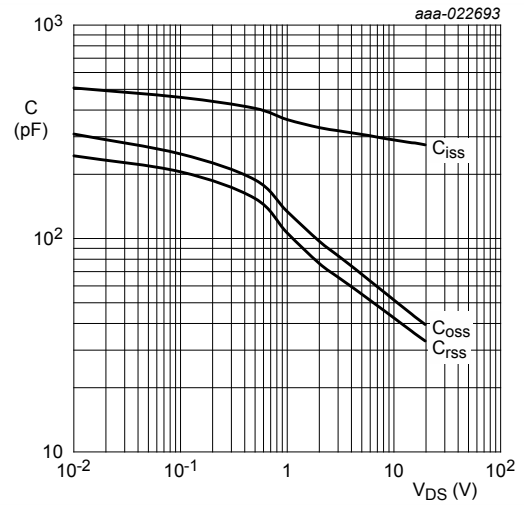
$$a = \frac{R_{DSon}}{R_{DSon}(25\text{ °C})}$$

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



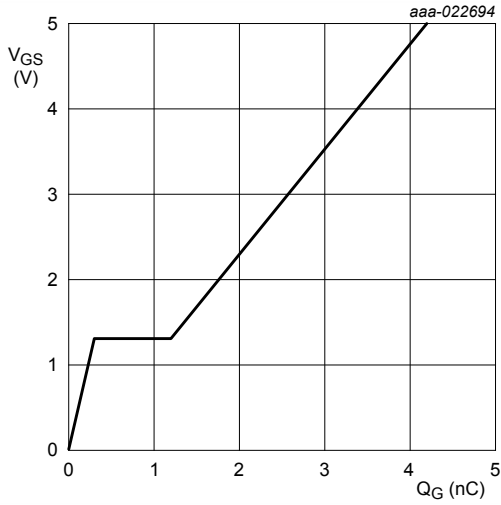
$$I_D = 250\ \mu\text{A}; V_{DS} = V_{GS}$$

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



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

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



$V_{DS} = 10\text{ V}; I_D = 2.8\text{ A}$

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

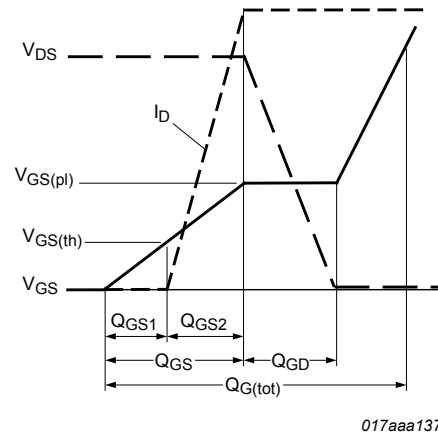
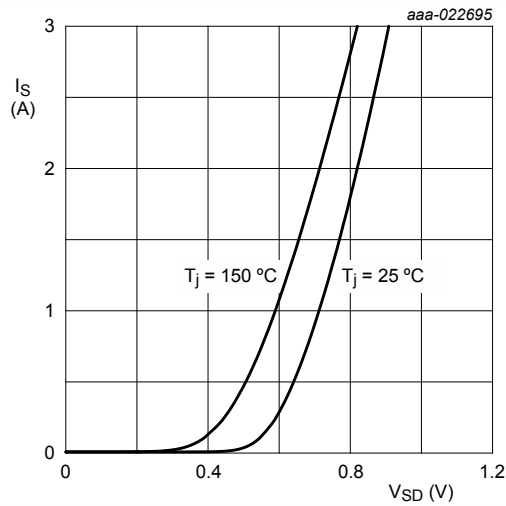


Fig. 15. Gate charge waveform definitions



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

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

11. Test information

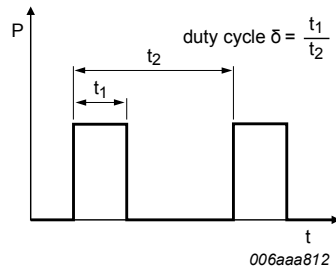


Fig. 17. Duty cycle definition

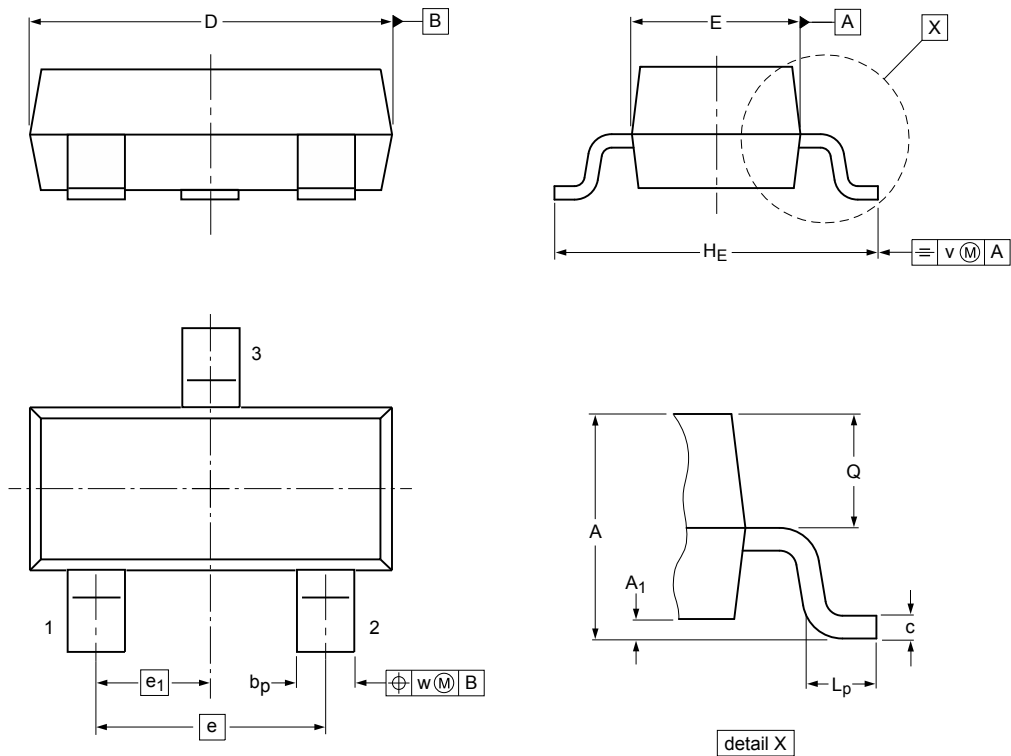
Quality information

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

Plastic surface-mounted package; 3 leads

SOT23



Dimensions (mm are the original dimensions)

Unit	A	A ₁	b _p	c	D	E	e	e ₁	H _E	L _p	Q	v	w
max	1.1	0.1	0.48	0.15	3.0	1.4			2.5	0.45	0.55		
nom							1.9	0.95				0.2	0.1
min	0.9		0.38	0.09	2.8	1.2			2.1	0.15	0.45		

sot023_po

Outline version	References			European projection	Issue date
	IEC	JEDEC	JEITA		
SOT23		TO-236AB			-14-06-19 14-09-22

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

13. Soldering

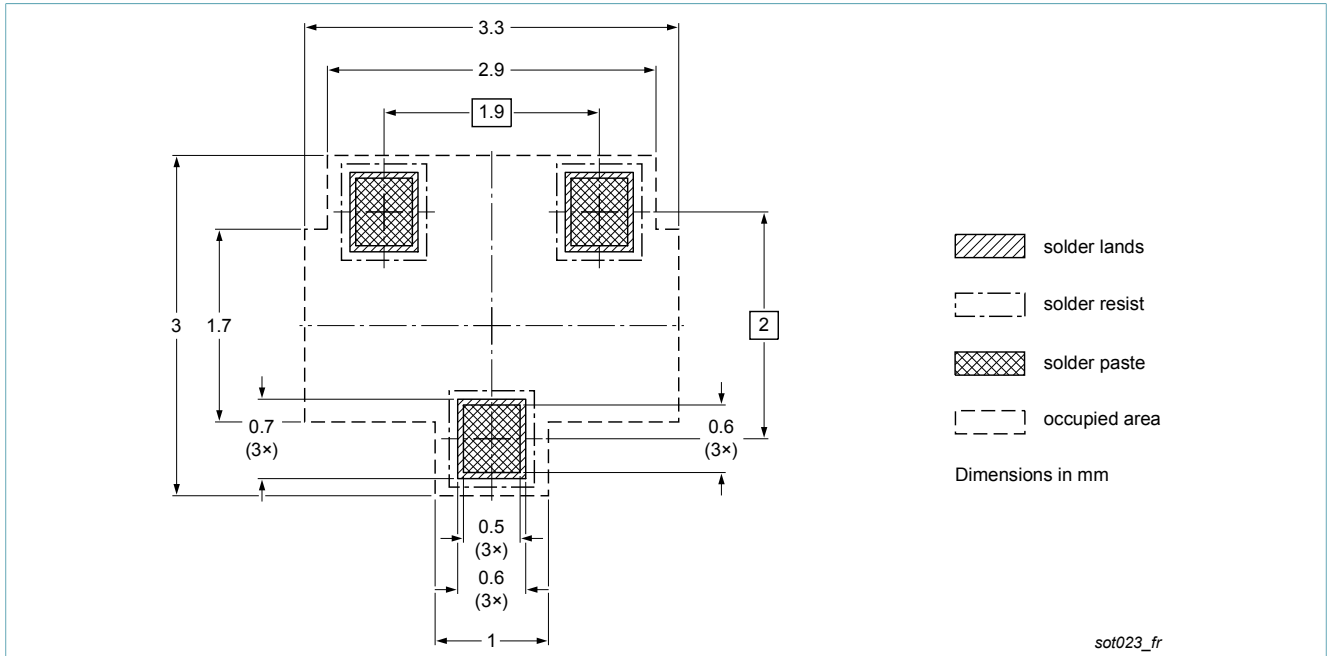


Fig. 19. Reflow soldering footprint for TO-236AB (SOT23)

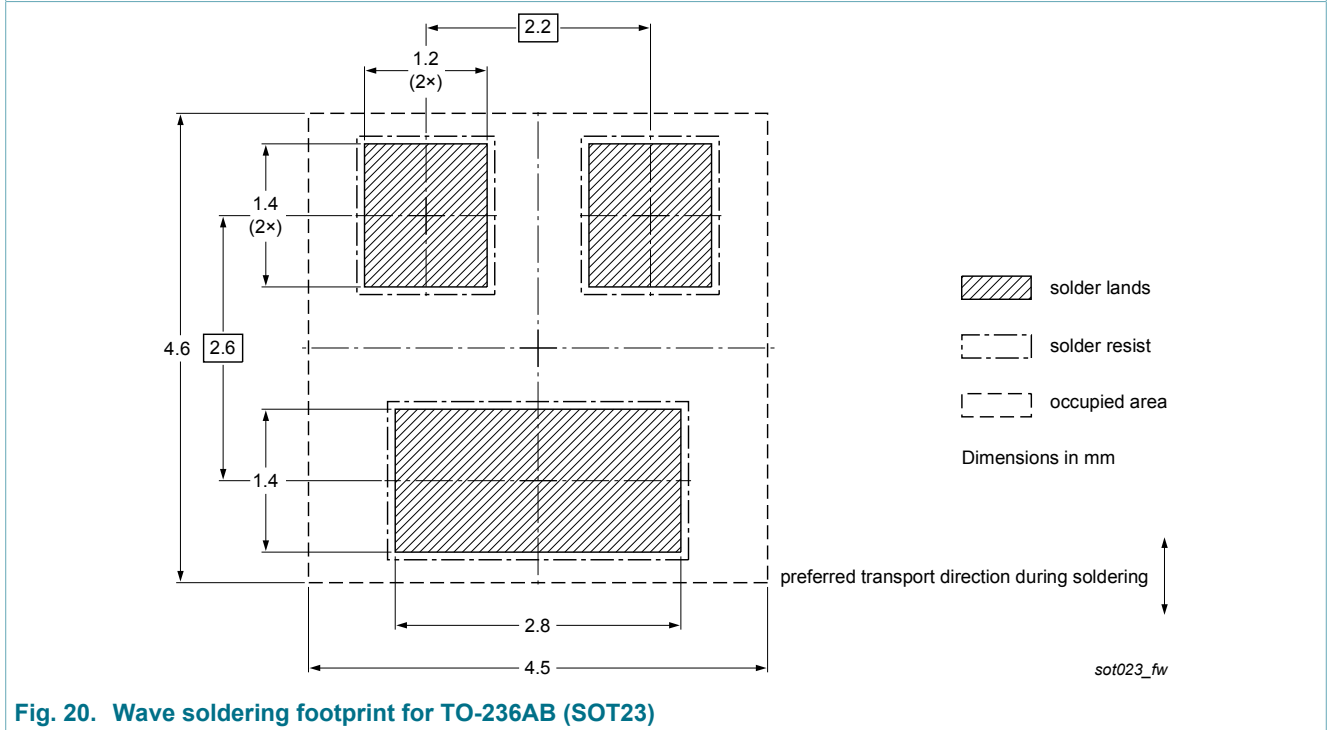


Fig. 20. Wave soldering footprint for TO-236AB (SOT23)

14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PMV65UNEA v.1	20170317	Product data sheet	-	-

15. Legal information

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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- [2] The term 'short data sheet' is explained in section "Definitions".
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