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Kind regards,

Team Nexperia

# PMG45UN

20 V, single N-channel Trench MOSFET

13 November 2012

Product data sheet

## 1. Product profile

### 1.1 General description

N-channel enhancement mode Field-Effect Transistor (FET) in a SOT363 (SC-88) small Surface-Mounted Device (SMD) plastic package using Trench MOSFET technology.

### 1.2 Features and benefits

- Low threshold voltage
- Very fast switching
- Trench MOSFET technology

### 1.3 Applications

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

### 1.4 Quick reference data

Table 1. Quick reference data

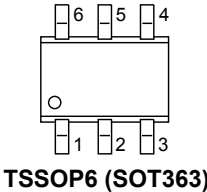
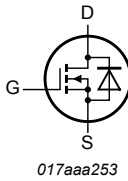
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{DS}$	drain-source voltage	$T_J = 25\text{ °C}$	-	-	20	V
$V_{GS}$	gate-source voltage		-8	-	8	V
$I_D$	drain current	$V_{GS} = 4.5\text{ V}; T_{amb} = 25\text{ °C}; t \leq 5\text{ s}$	[1]	-	3.3	A
<b>Static characteristics</b>						
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = 4.5\text{ V}; I_D = 3\text{ A}; T_J = 25\text{ °C}$	-	45	55	m $\Omega$

[1] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated, mounting pad for drain 6 cm<sup>2</sup>.



## 2. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	D	drain	 <p>TSSOP6 (SOT363)</p>	 <p>017aaa253</p>
2	D	drain		
3	G	gate		
4	S	source		
5	D	drain		
6	D	drain		

## 3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PMG45UN	TSSOP6	plastic surface-mounted package; 6 leads	SOT363

## 4. Marking

Table 4. Marking codes

Type number	Marking code
PMG45UN	U5%

[1] % = placeholder for manufacturing site code

## 5. Limiting values

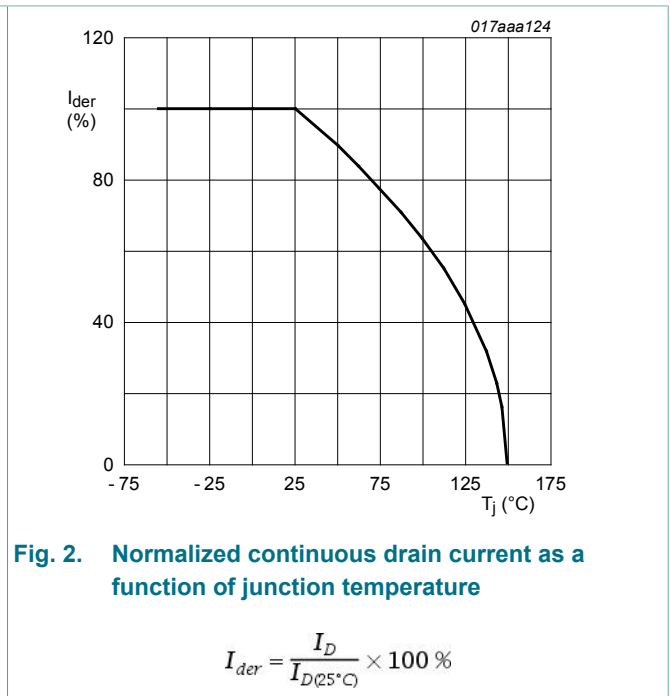
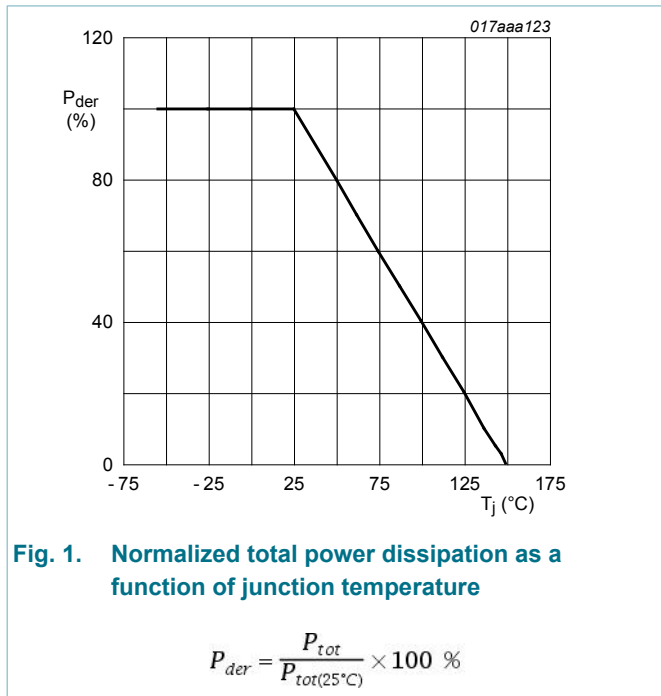
Table 5. Limiting values

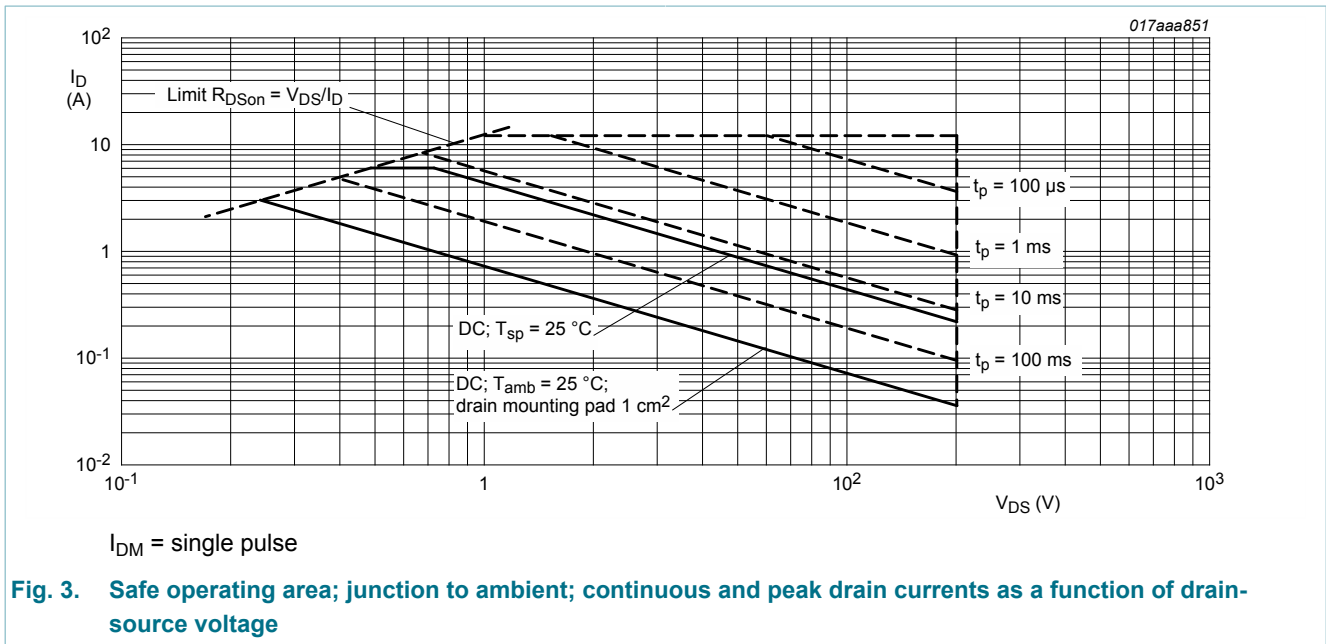
In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions		Min	Max	Unit
$V_{DS}$	drain-source voltage	$T_j = 25\text{ °C}$		-	20	V
$V_{GS}$	gate-source voltage			-8	8	V
$I_D$	drain current	$V_{GS} = 4.5\text{ V}; T_{amb} = 25\text{ °C}; t \leq 5\text{ s}$	[1]	-	3.3	A
		$V_{GS} = 4.5\text{ V}; T_{amb} = 25\text{ °C}$	[1]	-	3	A
		$V_{GS} = 4.5\text{ V}; T_{amb} = 100\text{ °C}$	[1]	-	1.9	A
$I_{DM}$	peak drain current	$T_{amb} = 25\text{ °C}; \text{single pulse}; t_p \leq 10\text{ }\mu\text{s}$		-	12	A
$P_{tot}$	total power dissipation	$T_{amb} = 25\text{ °C}$	[2]	-	375	mW
			[1]	-	715	mW

Symbol	Parameter	Conditions		Min	Max	Unit
		T <sub>sp</sub> = 25 °C		-	4350	mW
T <sub>j</sub>	junction temperature			-55	150	°C
T <sub>amb</sub>	ambient temperature			-55	150	°C
T <sub>stg</sub>	storage temperature			-65	150	°C
<b>Source-drain diode</b>						
I <sub>s</sub>	source current	T <sub>amb</sub> = 25 °C	[1]	-	0.8	A

- [1] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated, mounting pad for drain 6 cm<sup>2</sup>.
- [2] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated and standard footprint.





## 6. Thermal characteristics

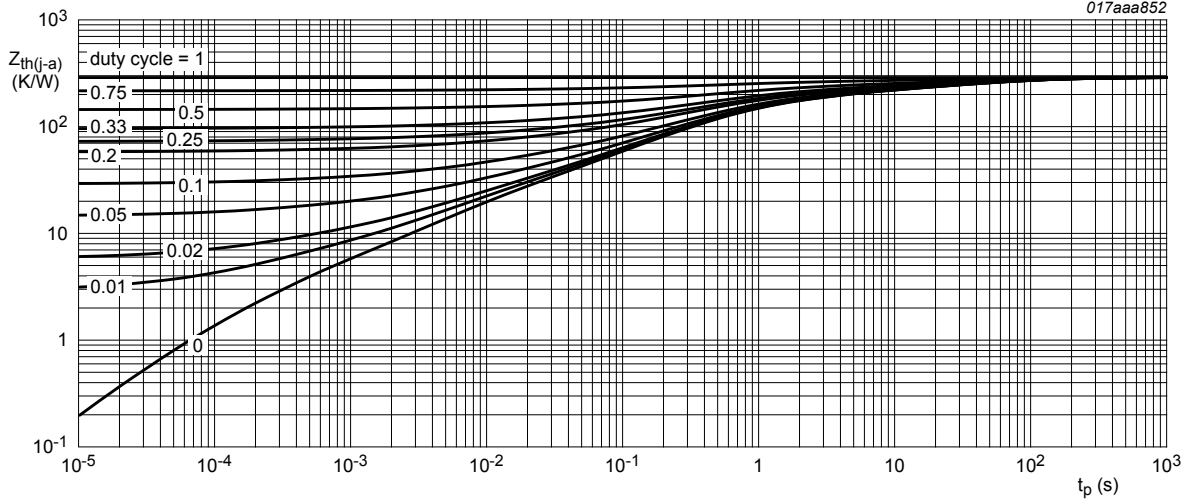
Table 6. Thermal characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1]	-	289	332	K/W
			[2]	-	152	175	K/W
			[3]	-	117	145	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point			-	25	29	K/W

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

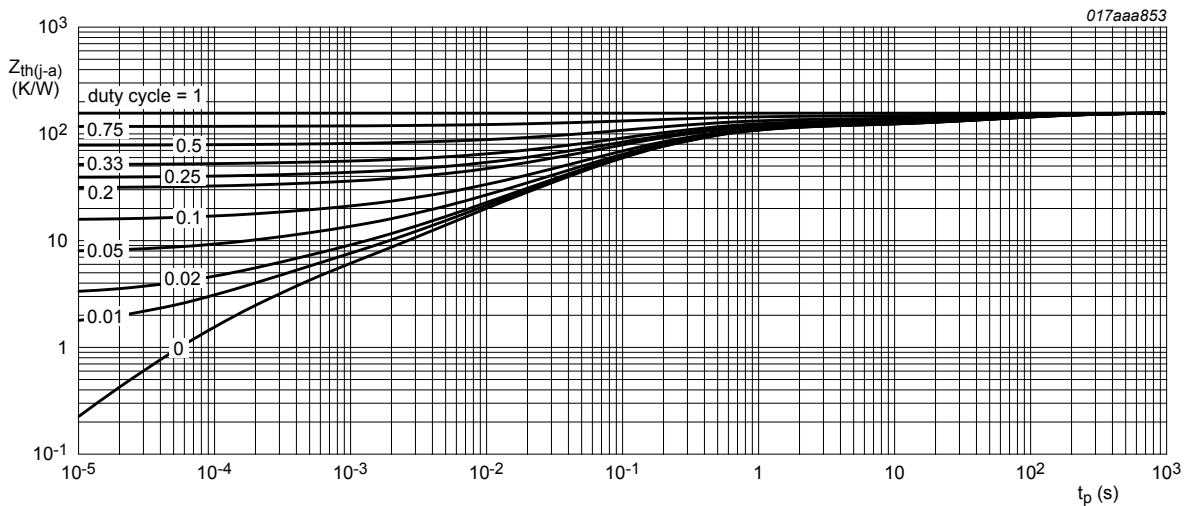
[2] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for drain  $6 \text{ cm}^2$ .

[3] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for drain  $6 \text{ cm}^2$ ,  $t \leq 5 \text{ s}$ .



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 cm<sup>2</sup>

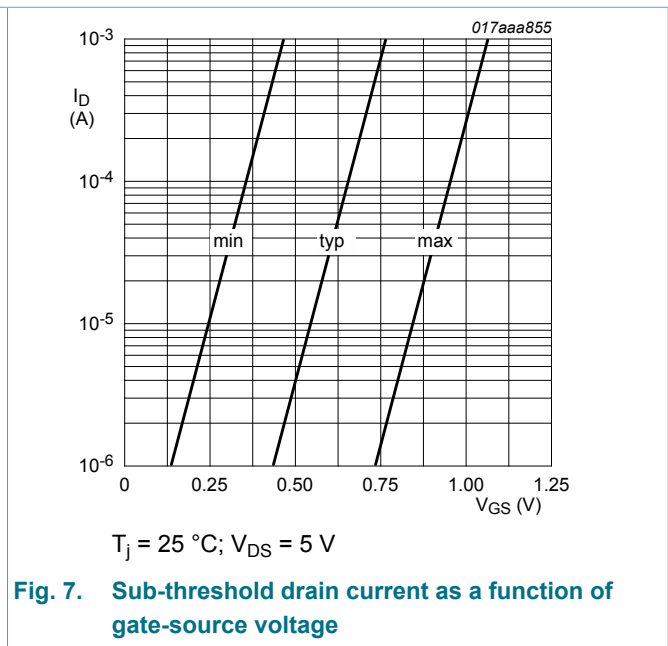
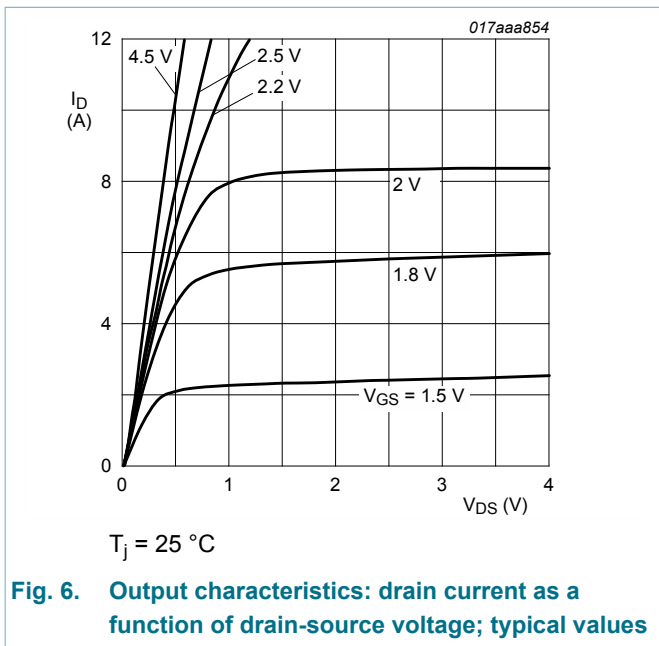
Fig. 5. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

## 7. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Static characteristics</b>						
$V_{(BR)DSS}$	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	$I_D = 250 \mu A; V_{DS} = V_{GS}; T_j = 25 \text{ }^\circ C$	0.4	0.7	1	V
$I_{DSS}$	drain leakage current	$V_{DS} = 20 V; V_{GS} = 0 V; T_j = 25 \text{ }^\circ C$	-	-	1	$\mu A$
$I_{GSS}$	gate leakage current	$V_{GS} = 8 V; V_{DS} = 0 V; T_j = 25 \text{ }^\circ C$	-	-	100	nA

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
		$V_{GS} = -8\text{ V}; V_{DS} = 0\text{ V}; T_j = 25\text{ }^\circ\text{C}$	-	-	-100	nA
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = 4.5\text{ V}; I_D = 3\text{ A}; T_j = 25\text{ }^\circ\text{C}$	-	45	55	m $\Omega$
		$V_{GS} = 4.5\text{ V}; I_D = 3\text{ A}; T_j = 150\text{ }^\circ\text{C}$	-	66	81	m $\Omega$
		$V_{GS} = 2.5\text{ V}; I_D = 2.5\text{ A}; T_j = 25\text{ }^\circ\text{C}$	-	58	76	m $\Omega$
		$V_{GS} = 1.8\text{ V}; I_D = 0.8\text{ A}; T_j = 25\text{ }^\circ\text{C}$	-	85	125	m $\Omega$
$g_{fs}$	forward transconductance	$V_{DS} = 10\text{ V}; I_D = 3\text{ A}; T_j = 25\text{ }^\circ\text{C}$	-	11.2	-	S
<b>Dynamic characteristics</b>						
$Q_{G(tot)}$	total gate charge	$V_{DS} = 10\text{ V}; I_D = 3\text{ A}; V_{GS} = 4.5\text{ V}; T_j = 25\text{ }^\circ\text{C}$	-	2.2	3.3	nC
$Q_{GS}$	gate-source charge	$T_j = 25\text{ }^\circ\text{C}$	-	0.32	-	nC
$Q_{GD}$	gate-drain charge		-	0.56	-	nC
$C_{iss}$	input capacitance		$V_{DS} = 10\text{ V}; f = 1\text{ MHz}; V_{GS} = 0\text{ V}; T_j = 25\text{ }^\circ\text{C}$	-	184	-
$C_{oss}$	output capacitance	$T_j = 25\text{ }^\circ\text{C}$	-	51	-	pF
$C_{rss}$	reverse transfer capacitance		-	29	-	pF
$t_{d(on)}$	turn-on delay time		$V_{DS} = 10\text{ V}; I_D = 3\text{ A}; V_{GS} = 4.5\text{ V}; R_{G(ext)} = 6\text{ }^\Omega; T_j = 25\text{ }^\circ\text{C}$	-	8	-
$t_r$	rise time	$R_{G(ext)} = 6\text{ }^\Omega; T_j = 25\text{ }^\circ\text{C}$	-	30	-	ns
$t_{d(off)}$	turn-off delay time		-	30	-	ns
$t_f$	fall time		-	26	-	ns
<b>Source-drain diode</b>						
$V_{SD}$	source-drain voltage	$I_S = 0.8\text{ A}; V_{GS} = 0\text{ V}; T_j = 25\text{ }^\circ\text{C}$	-	0.8	1.2	V



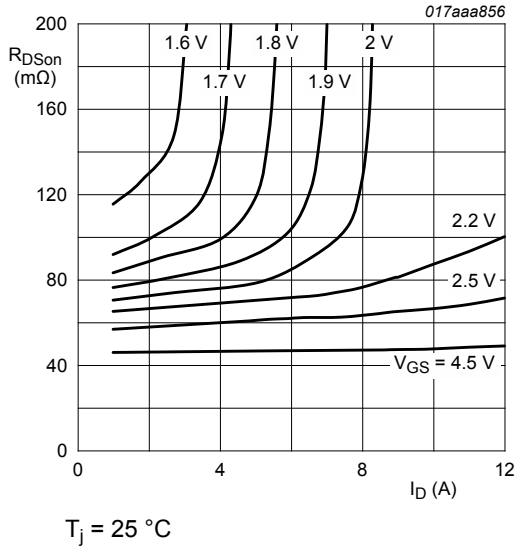


Fig. 8. Drain-source on-state resistance as a function of drain current; typical values

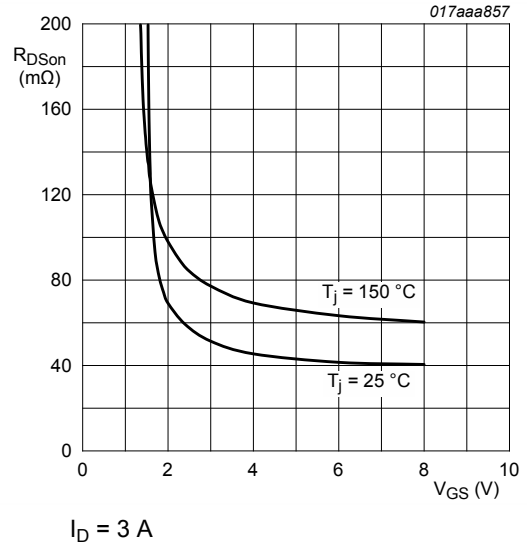


Fig. 9. Drain-source on-state resistance as a function of gate-source voltage; typical values

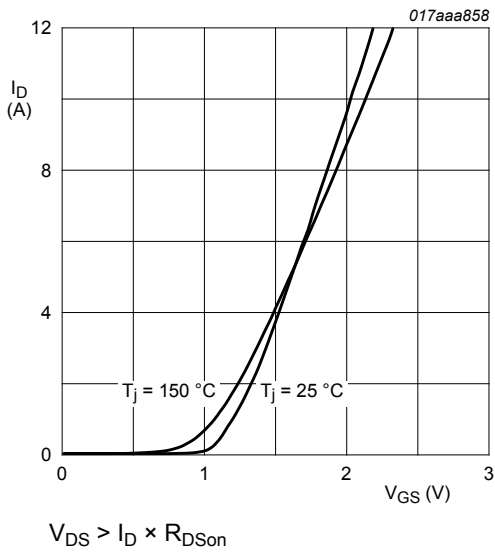


Fig. 10. Transfer characteristics: drain current as a function of gate-source voltage; typical values

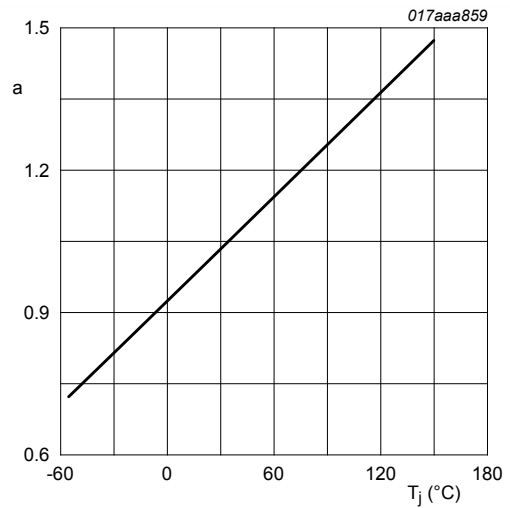
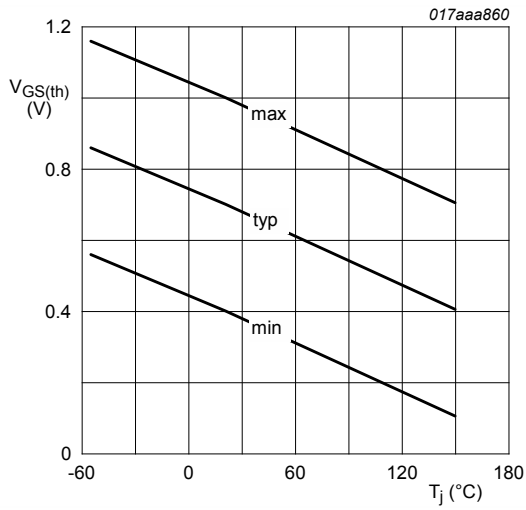


Fig. 11. Normalized drain-source on-state resistance as a function of junction temperature; typical values

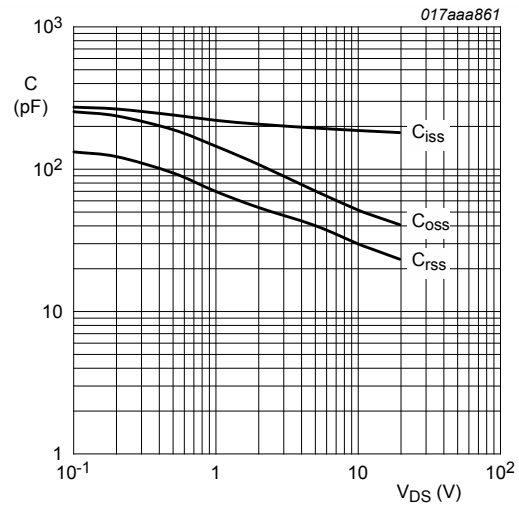
$$a = \frac{R_{DSon}}{R_{DSon(25^\circ\text{C})}}$$





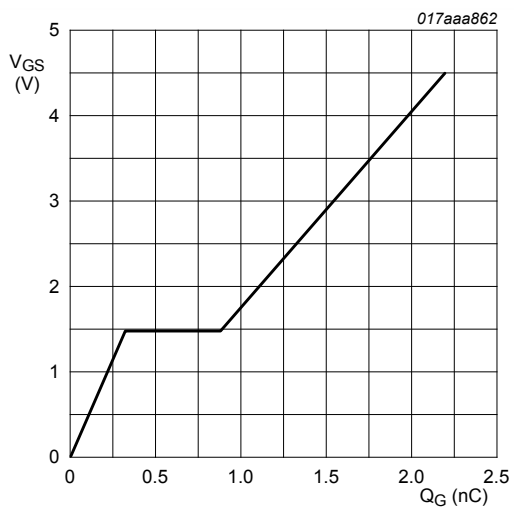
$I_D = 0.25 \text{ mA}; V_{DS} = V_{GS}$

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



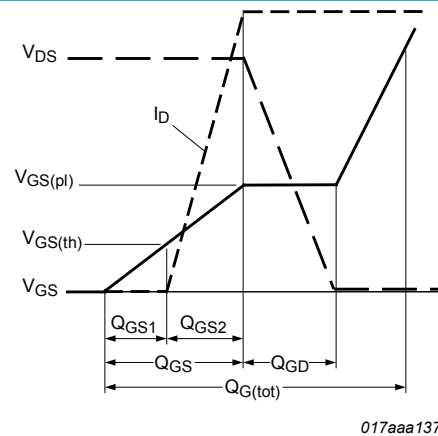
$f = 1 \text{ MHz}; V_{GS} = 0 \text{ V}$

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

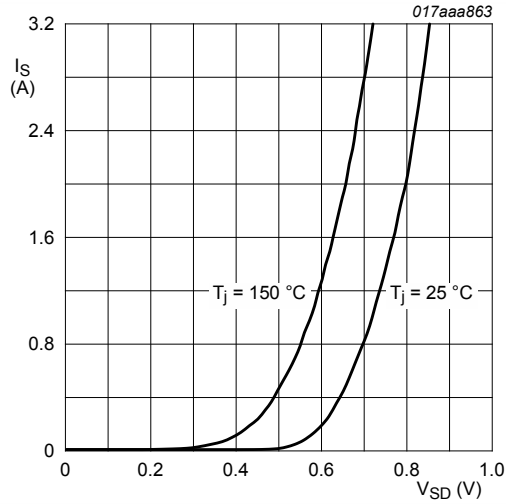


$I_D = 3 \text{ A}; V_{DS} = 10 \text{ V}; T_{amb} = 25 \text{ }^\circ\text{C}$

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



**Fig. 15. Gate charge waveform definitions**



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

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

### 8. Test information

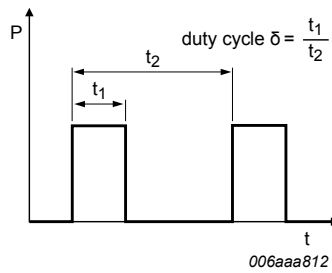


Fig. 17. Duty cycle definition

### 9. Package outline

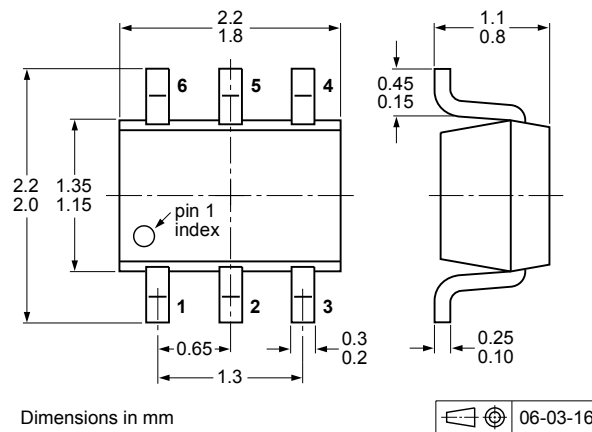


Fig. 18. Package outline TSSOP6 (SOT363)

### 10. Soldering

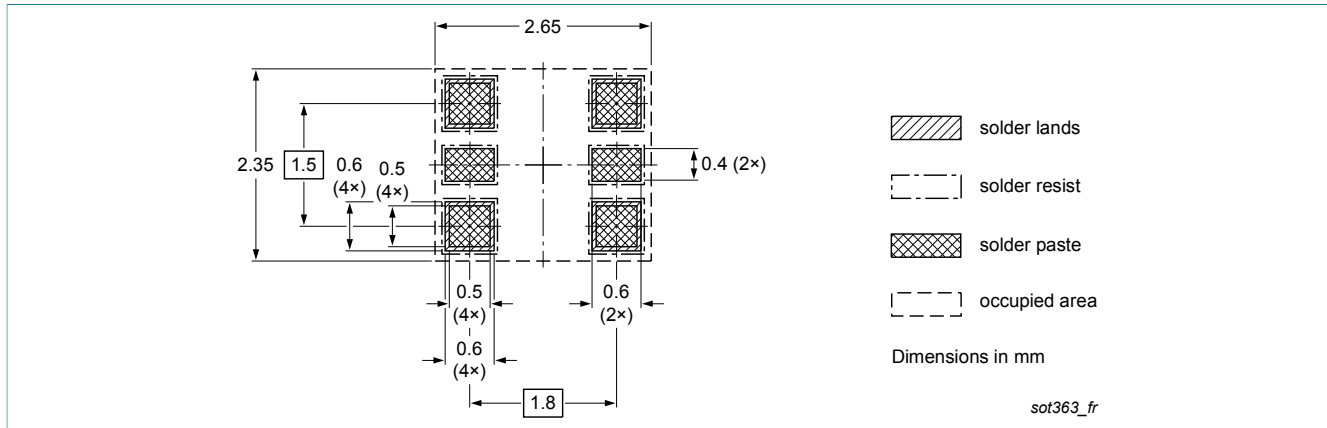


Fig. 19. Reflow soldering footprint for TSSOP6 (SOT363)

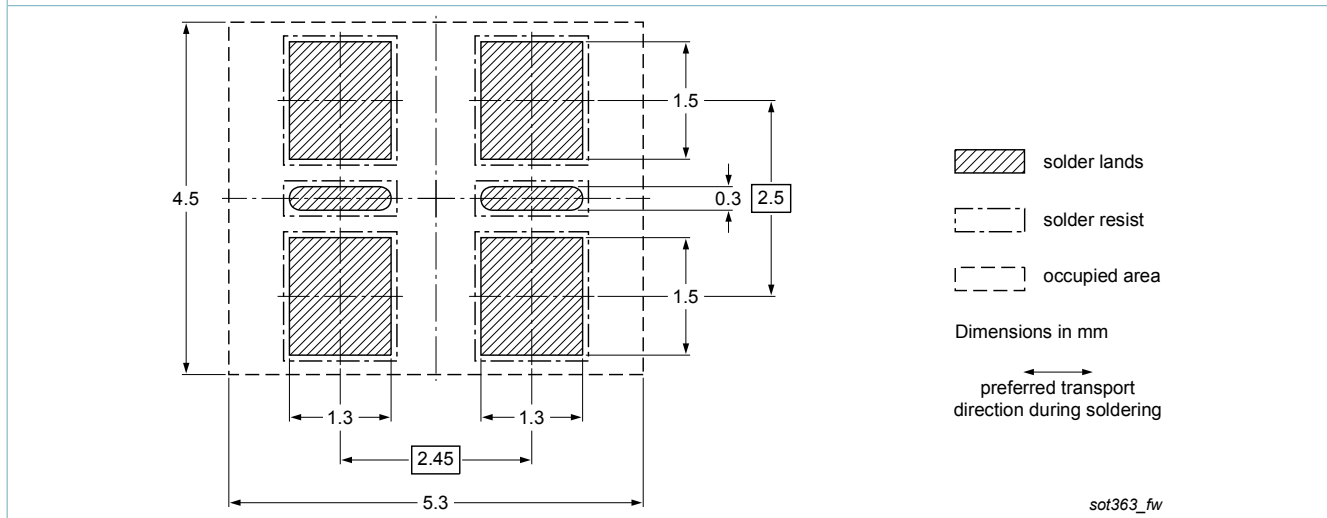


Fig. 20. Wave soldering footprint for TSSOP6 (SOT363)

### 11. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PMG45UN v.1	20121113	Product data sheet	-	-

## 12. Legal information

### 12.1 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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Date of release: 13 November 2012

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