



# PMGD130UN

20 V, dual N-channel Trench MOSFET

Rev. 1 — 1 June 2012

Product data sheet

## 1. Product profile

### 1.1 General description

Dual N-channel enhancement mode Field-Effect Transistor (FET) in a very small SOT363 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

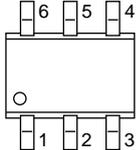
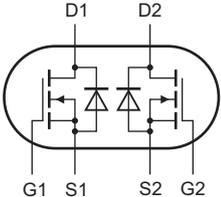
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Per transistor</b>						
$V_{DS}$	drain-source voltage	$T_j = 25\text{ °C}$	-	-	20	V
$V_{GS}$	gate-source voltage		-8	-	8	V
$I_D$	drain current	$V_{GS} = 4.5\text{ V}; T_{amb} = 25\text{ °C}; t \leq 5\text{ s}$	[1]	-	1.3	A
<b>Static characteristics (per transistor)</b>						
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = 4.5\text{ V}; I_D = 1.2\text{ A}; T_j = 25\text{ °C}$	-	118	145	mΩ

[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	S1	source TR1	 <p><b>SOT363 (TSSOP6)</b></p>	 <p>017aaa254</p>
2	G1	gate TR1		
3	D2	drain TR2		
4	S2	source TR2		
5	G2	gate TR2		
6	D1	drain TR1		

## 3. Ordering information

**Table 3. Ordering information**

Type number	Package		
	Name	Description	Version
PMGD130UN	TSSOP6	plastic surface-mounted package; 6 leads	SOT363

## 4. Marking

**Table 4. Marking codes**

Type number	Marking code <sup>[1]</sup>
PMGD130UN	U8%

[1] % = placeholder for manufacturing site code

## 5. Limiting values

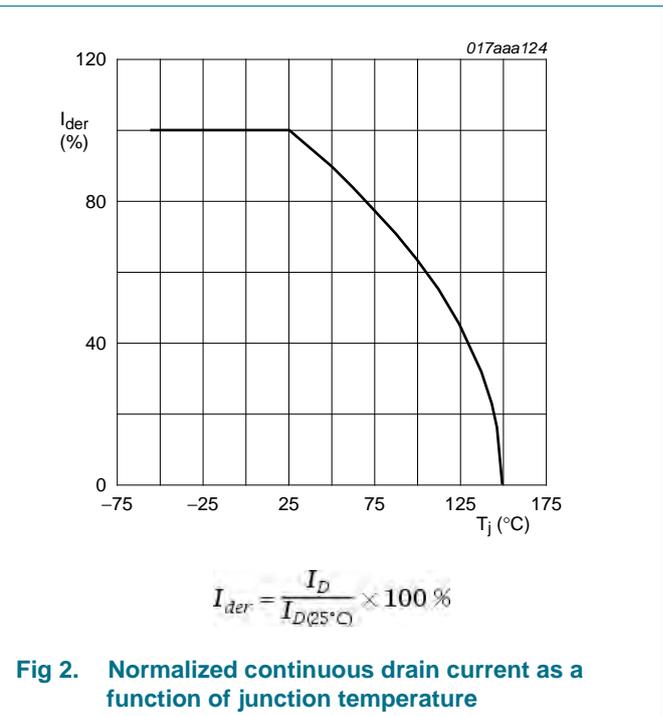
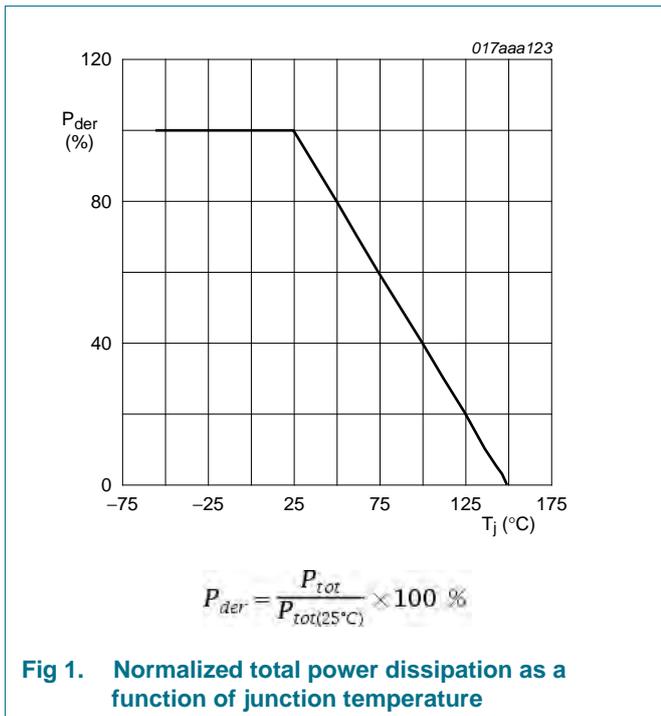
**Table 5. Limiting values**

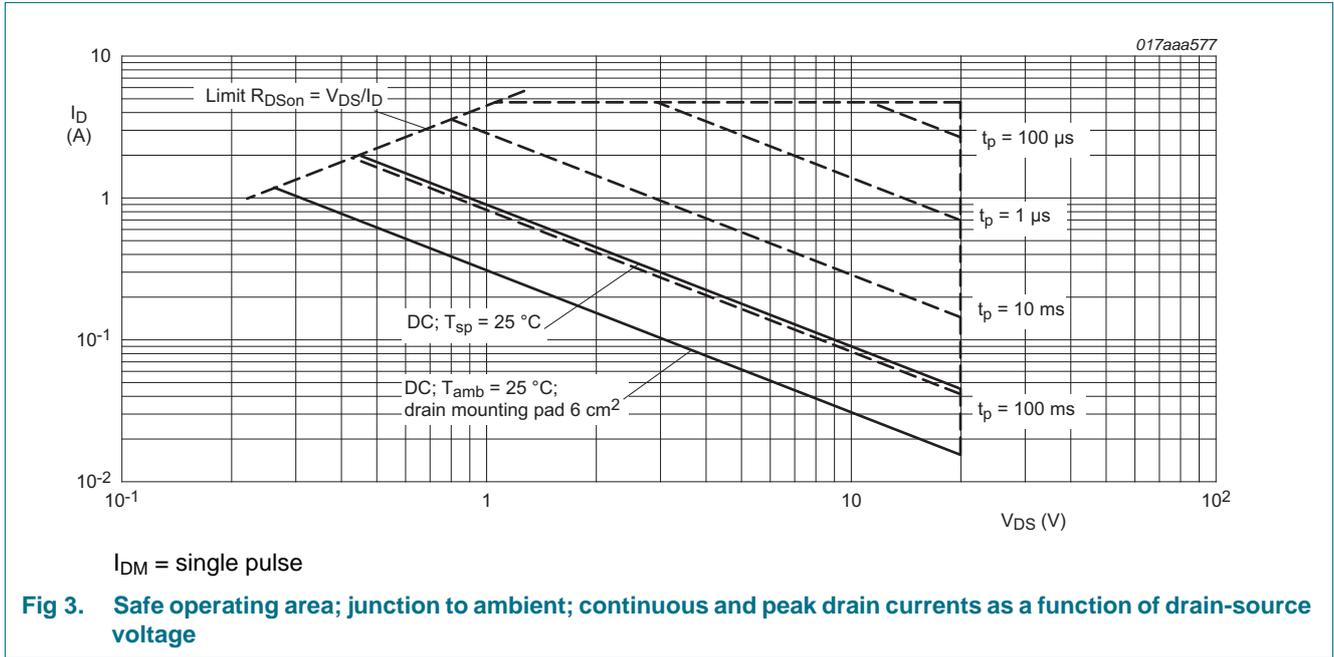
In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions	Min	Max	Unit	
<b>Per transistor</b>						
V <sub>DS</sub>	drain-source voltage	T <sub>j</sub> = 25 °C	-	20	V	
V <sub>GS</sub>	gate-source voltage		-8	8	V	
I <sub>D</sub>	drain current	V <sub>GS</sub> = 4.5 V; T <sub>amb</sub> = 25 °C; t ≤ 5 s	[1]	-	1.3	A
		V <sub>GS</sub> = 4.5 V; T <sub>amb</sub> = 25 °C	[1]	-	1.2	A
		V <sub>GS</sub> = 4.5 V; T <sub>amb</sub> = 100 °C	[1]	-	0.7	A
I <sub>DM</sub>	peak drain current	T <sub>amb</sub> = 25 °C; single pulse; t <sub>p</sub> ≤ 10 μs	-	4.8	A	
P <sub>tot</sub>	total power dissipation	T <sub>amb</sub> = 25 °C	[2]	-	260	mW
			[1]	-	310	mW
		T <sub>sp</sub> = 25 °C		-	905	mW
<b>Source-drain diode</b>						
I <sub>S</sub>	source current	T <sub>amb</sub> = 25 °C	[1]	-	0.7	A
<b>Per device</b>						
P <sub>tot</sub>	total power dissipation	T <sub>amb</sub> = 25 °C	[2]	-	390	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	

[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 PCB, single-sided copper, tin-plated and standard footprint.



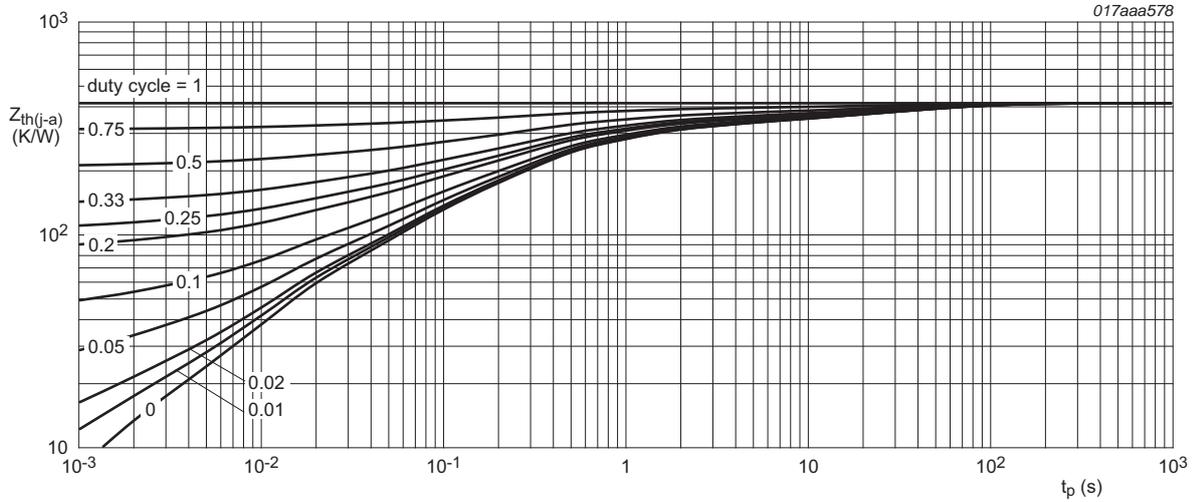


## 6. Thermal characteristics

Table 6. Thermal characteristics

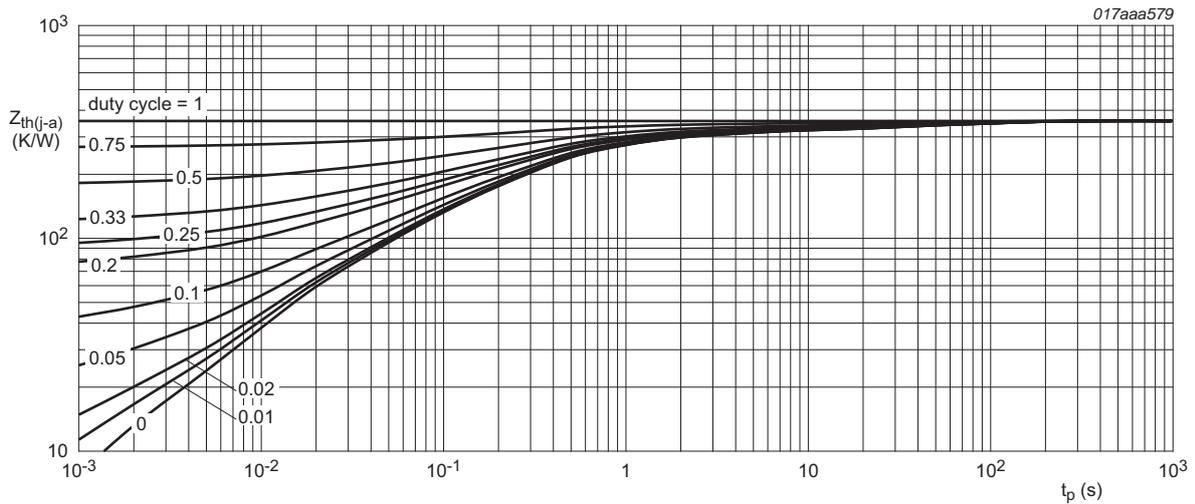
Symbol	Parameter	Conditions	Min	Typ	Max	Unit	
<b>Per transistor</b>							
R <sub>th(j-a)</sub>	thermal resistance from junction to ambient	in free air	[1]	-	417	480	K/W
			[2]	-	352	405	K/W
			[3]	-	295	340	K/W
R <sub>th(j-sp)</sub>	thermal resistance from junction to solder point		-	120	138	K/W	
<b>Per device</b>							
R <sub>th(j-a)</sub>	thermal resistance from junction to ambient	in free air	[1]	-	-	320	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 cm<sup>2</sup>.
- [3] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for drain 6 cm<sup>2</sup>, t ≤ 5 s.



FR4 PCB, standard footprint

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



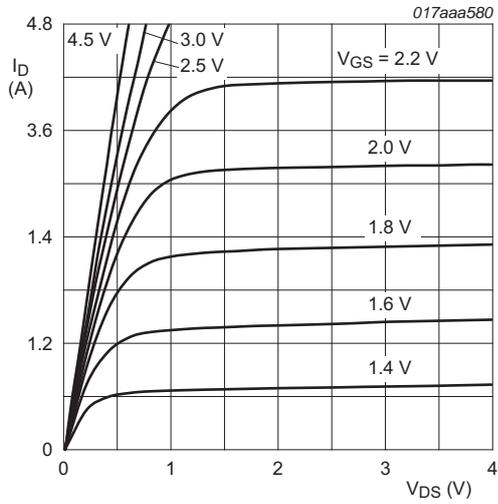
FR4 PCB, mounting pad for drain 6 cm<sup>2</sup>

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

## 7. Characteristics

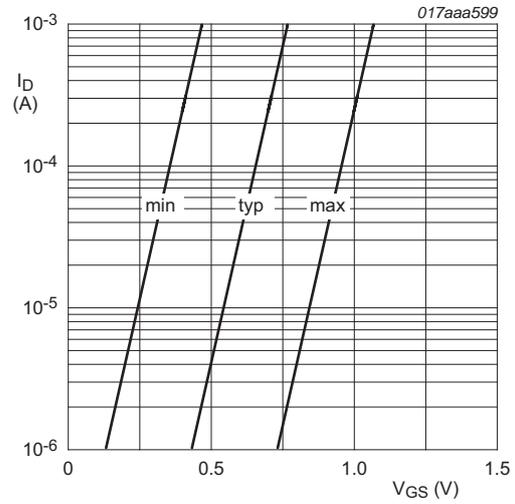
Table 7. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Static characteristics (per transistor)</b>						
$V_{(BR)DSS}$	drain-source breakdown voltage	$I_D = 250 \mu\text{A}$ ; $V_{GS} = 0 \text{ V}$ ; $T_j = 25 \text{ }^\circ\text{C}$	20	-	-	V
$V_{GSth}$	gate-source threshold voltage	$I_D = 250 \mu\text{A}$ ; $V_{DS} = V_{GS}$ ; $T_j = 25 \text{ }^\circ\text{C}$	0.4	0.7	1	V
$I_{DSS}$	drain leakage current	$V_{DS} = 20 \text{ V}$ ; $V_{GS} = 0 \text{ V}$ ; $T_j = 25 \text{ }^\circ\text{C}$	-	-	1	$\mu\text{A}$
		$V_{DS} = 20 \text{ V}$ ; $V_{GS} = 0 \text{ V}$ ; $T_j = 150 \text{ }^\circ\text{C}$	-	-	10	$\mu\text{A}$
$I_{GSS}$	gate leakage current	$V_{GS} = 8 \text{ V}$ ; $V_{DS} = 0 \text{ V}$ ; $T_j = 25 \text{ }^\circ\text{C}$	-	-	100	nA
		$V_{GS} = -8 \text{ V}$ ; $V_{DS} = 0 \text{ V}$ ; $T_j = 25 \text{ }^\circ\text{C}$	-	-	100	nA
$R_{DSon}$	drain-source on-state resistance	$V_{GS} = 4.5 \text{ V}$ ; $I_D = 1.2 \text{ A}$ ; $T_j = 25 \text{ }^\circ\text{C}$	-	118	145	m $\Omega$
		$V_{GS} = 4.5 \text{ V}$ ; $I_D = 1.2 \text{ A}$ ; $T_j = 150 \text{ }^\circ\text{C}$	-	179	220	m $\Omega$
		$V_{GS} = 2.5 \text{ V}$ ; $I_D = 1 \text{ A}$ ; $T_j = 25 \text{ }^\circ\text{C}$	-	155	204	m $\Omega$
		$V_{GS} = 1.8 \text{ V}$ ; $I_D = 0.25 \text{ A}$ ; $T_j = 25 \text{ }^\circ\text{C}$	-	213	318	m $\Omega$
$g_{fs}$	forward transconductance	$V_{DS} = 10 \text{ V}$ ; $I_D = 1.2 \text{ A}$ ; $T_j = 25 \text{ }^\circ\text{C}$	-	4.1	-	S
<b>Dynamic characteristics (per transistor)</b>						
$Q_{G(tot)}$	total gate charge	$V_{DS} = 10 \text{ V}$ ; $I_D = 1.2 \text{ A}$ ; $V_{GS} = 4.5 \text{ V}$ ; $T_j = 25 \text{ }^\circ\text{C}$	-	0.88	1.3	nC
$Q_{GS}$	gate-source charge		-	0.12	-	nC
$Q_{GD}$	gate-drain charge		-	0.26	-	nC
$C_{iss}$	input capacitance	$V_{DS} = 10 \text{ V}$ ; $f = 1 \text{ MHz}$ ; $V_{GS} = 0 \text{ V}$ ; $T_j = 25 \text{ }^\circ\text{C}$	-	83	-	pF
$C_{oss}$	output capacitance		-	38	-	pF
$C_{rss}$	reverse transfer capacitance		-	27	-	pF
$t_{d(on)}$	turn-on delay time	$V_{DS} = 10 \text{ V}$ ; $I_D = 1.2 \text{ A}$ ; $V_{GS} = 4.5 \text{ V}$ ; $R_{G(ext)} = 6 \Omega$ ; $T_j = 25 \text{ }^\circ\text{C}$	-	5	-	ns
$t_r$	rise time		-	17	-	ns
$t_{d(off)}$	turn-off delay time		-	17	-	ns
$t_f$	fall time		-	7	-	ns
<b>Source-drain diode (per transistor)</b>						
$V_{SD}$	source-drain voltage	$I_S = 0.7 \text{ A}$ ; $V_{GS} = 0 \text{ V}$ ; $T_j = 25 \text{ }^\circ\text{C}$	-	0.8	1.2	V



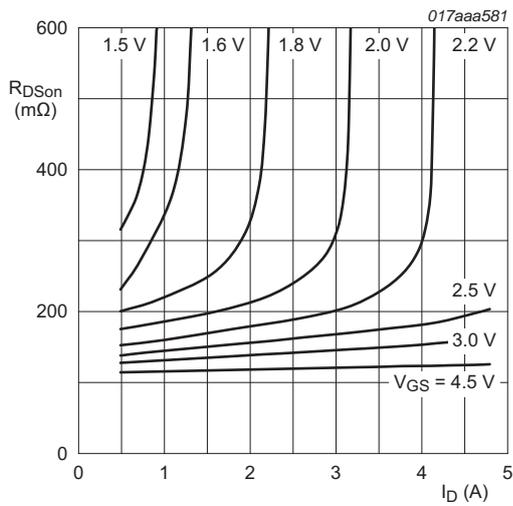
$T_j = 25\text{ }^\circ\text{C}$

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



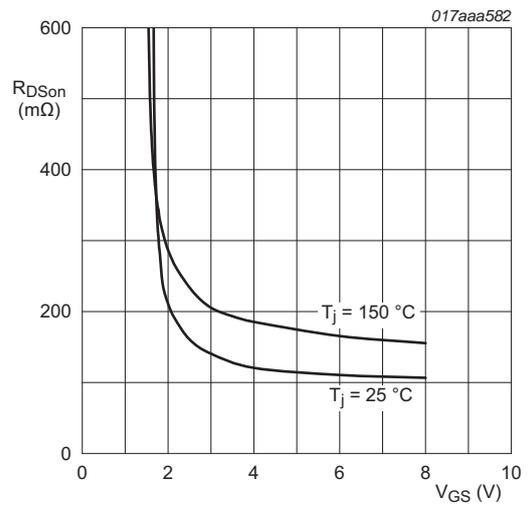
$T_j = 25\text{ }^\circ\text{C}; V_{DS} = 5\text{ V}$

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



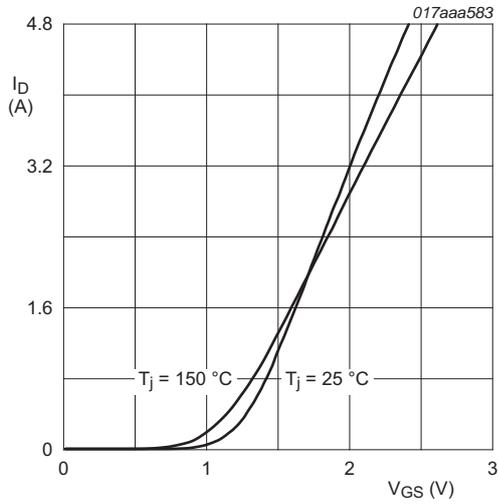
$T_j = 25\text{ }^\circ\text{C}$

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



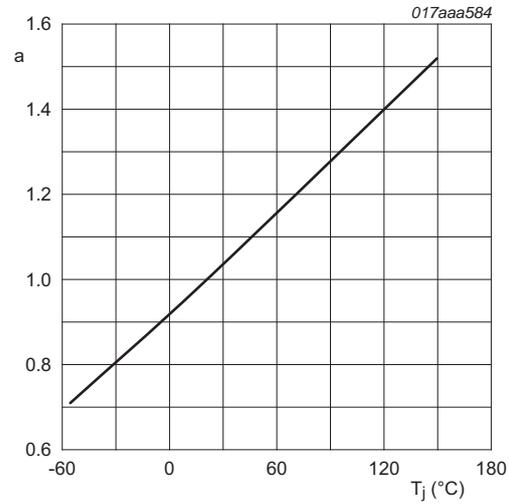
$I_D = 1\text{ A}$

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



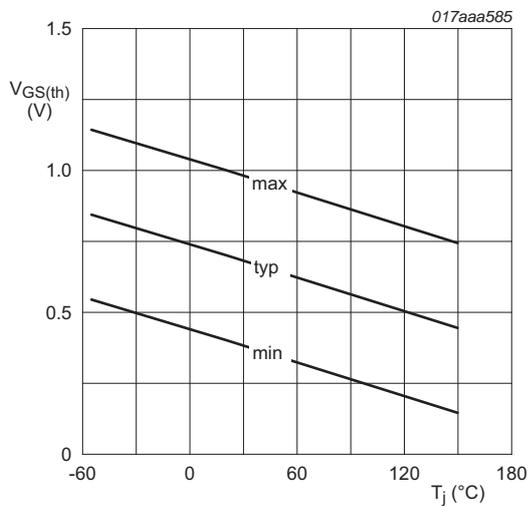
$$V_{DS} > I_D \times R_{DS(on)}$$

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



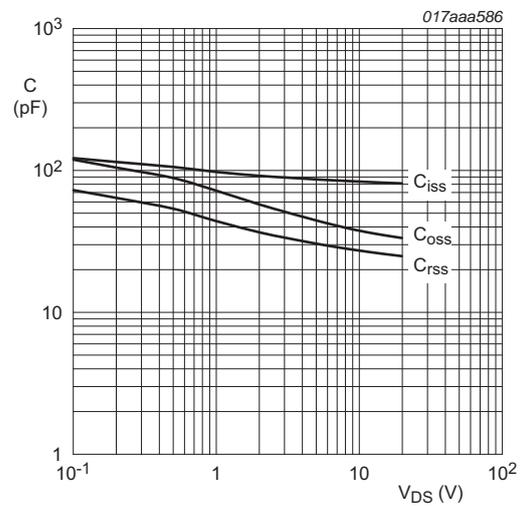
$$a = \frac{R_{DS(on)}}{R_{DS(on)(25^\circ C)}}$$

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



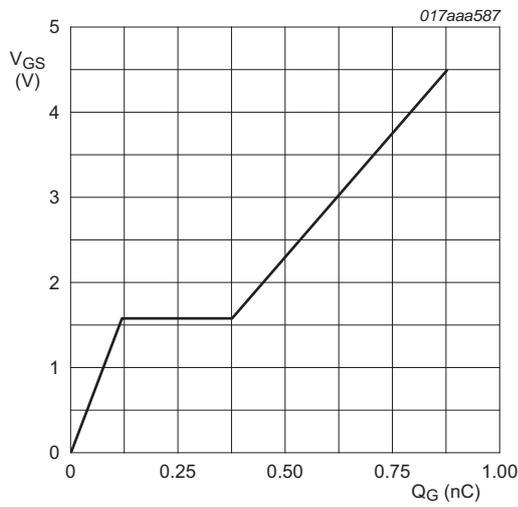
$$I_D = 0.25 \text{ mA}; V_{DS} = V_{GS}$$

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



$I_D = 1.2$  A;  $V_{DS} = 10$  V;  $T_{amb} = 25$  °C

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

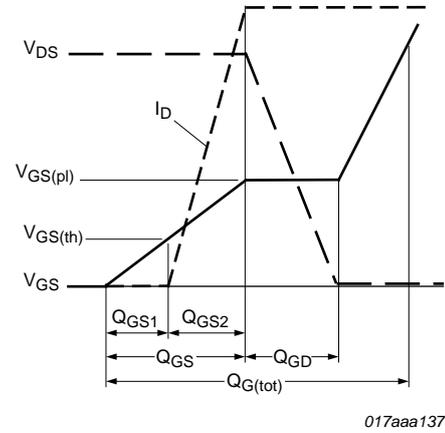
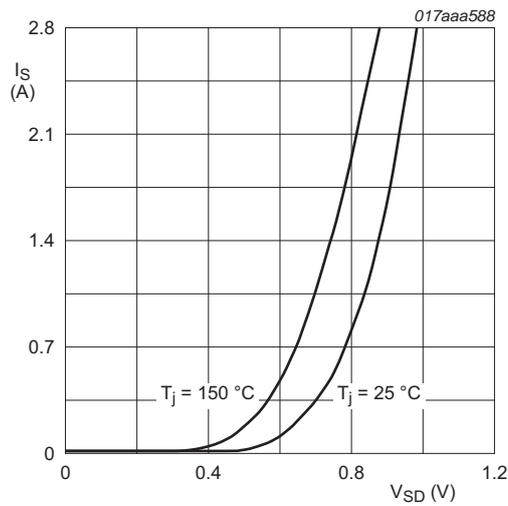


Fig 15. Gate charge waveform definitions



$V_{GS} = 0$  V

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

### 8. Test information

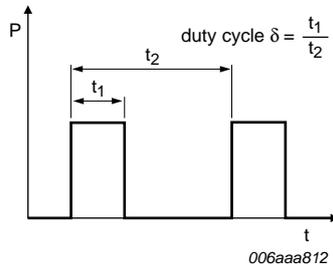


Fig 17. Duty cycle definition

### 9. Package outline

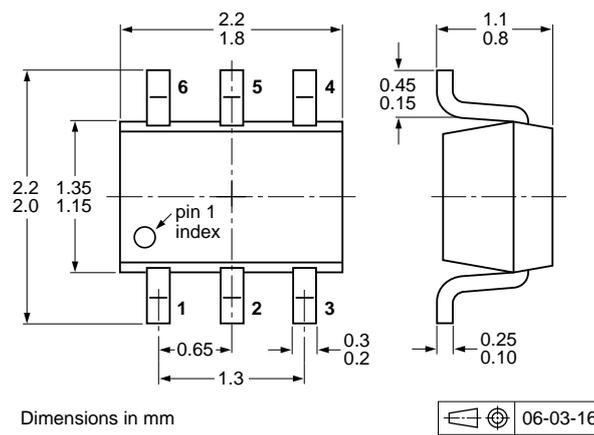


Fig 18. Package outline SOT363 (TSSOP6)

### 10. Soldering

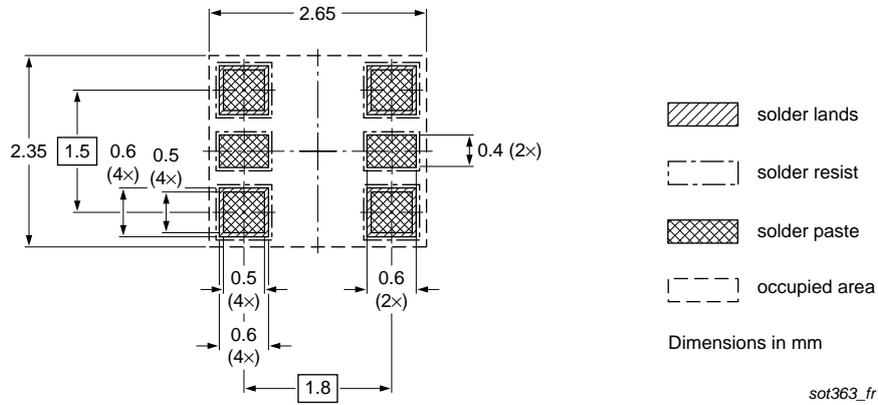


Fig 19. Reflow soldering footprint for SOT363 (TSSOP6)

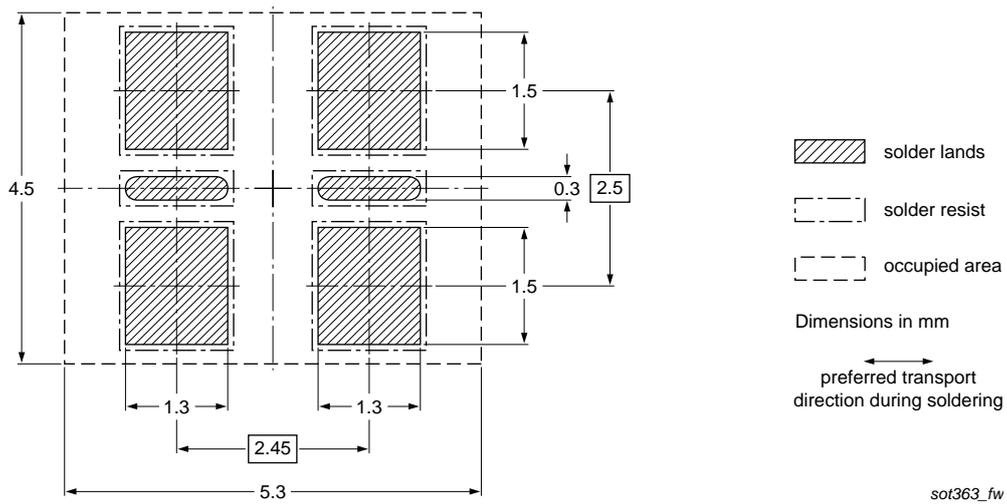


Fig 20. Wave soldering footprint for SOT363 (TSSOP6)

## 11. Revision history

Table 8. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
PMGD130UN v.1	20120601	Product data sheet	-	-

## 12. Legal information

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Document status <sup>[1]</sup> [2]	Product status <sup>[3]</sup>	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: 1 June 2012

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