



# PMN27UP

20 V, 5.7 A P-channel Trench MOSFET

Rev. 1 — 13 July 2011

Product data sheet

## 1. Product profile

### 1.1 General description

P-channel enhancement mode Field-Effect Transistor (FET) in a small SOT457 (SC-74) Surface-Mounted Device (SMD) plastic package using Trench MOSFET technology.

### 1.2 Features and benefits

- 1.8 V  $R_{DSon}$  rated
- Very fast switching
- Trench MOSFET technology

### 1.3 Applications

- Relay driver
- High-speed line driver
- High-side load switch
- 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	$V_{GS} = -4.5\text{ V}; T_{amb} = 25\text{ °C}$	[1]	-	-5.7	A
<b>Static characteristics</b>						
$R_{DSon}$	drain-source on-state resistance	$V_{GS} = -4.5\text{ V}; I_D = -2.4\text{ A}; T_j = 25\text{ °C}$	-	27	32	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>SOT457 (TSOP6)</p>	<p>017aaa094</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		Version
	Name	Description	
PMN27UP	TSOP6	plastic surface-mounted package (TSOP6); 6 leads	SOT457

### 4. Marking

Table 4. Marking codes

Type number	Marking code
PMN27UP	ZU

### 5. Limiting values

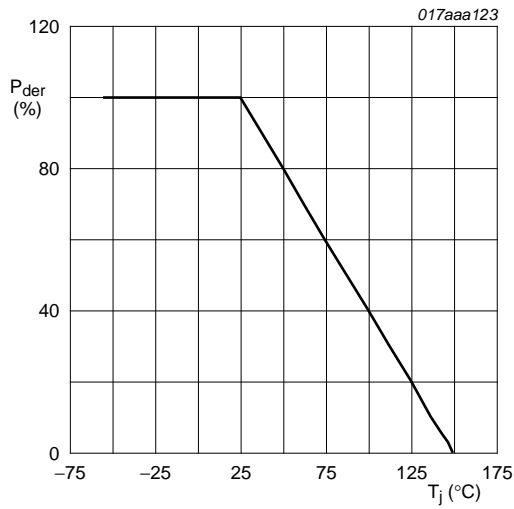
Table 5. Limiting values

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	$V_{GS} = -4.5\text{ V}; T_{amb} = 25\text{ °C}$	[1]	-	-5.7	A
		$V_{GS} = -4.5\text{ V}; T_{amb} = 100\text{ °C}$	[1]	-	-3.5	A
$I_{DM}$	peak drain current	$T_{amb} = 25\text{ °C};$ single pulse; $t_p \leq 10\text{ }\mu\text{s}$	-	-23	A	
$P_{tot}$	total power dissipation	$T_{amb} = 25\text{ °C}$	[2]	-	540	mW
			[1]	-	1385	mW
		$T_{sp} = 25\text{ °C}$		-	6250	mW
$T_j$	junction temperature		-55	150	°C	
$T_{amb}$	ambient temperature		-55	150	°C	
$T_{stg}$	storage temperature		-65	150	°C	
<b>Source-drain diode</b>						
$I_S$	source current	$T_{amb} = 25\text{ °C}$	[1]	-	-1.5	A

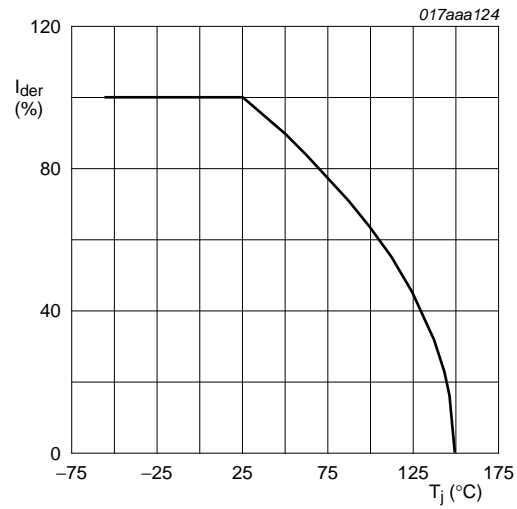
[1] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated, mounting pad for drain 6 cm<sup>2</sup>.

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



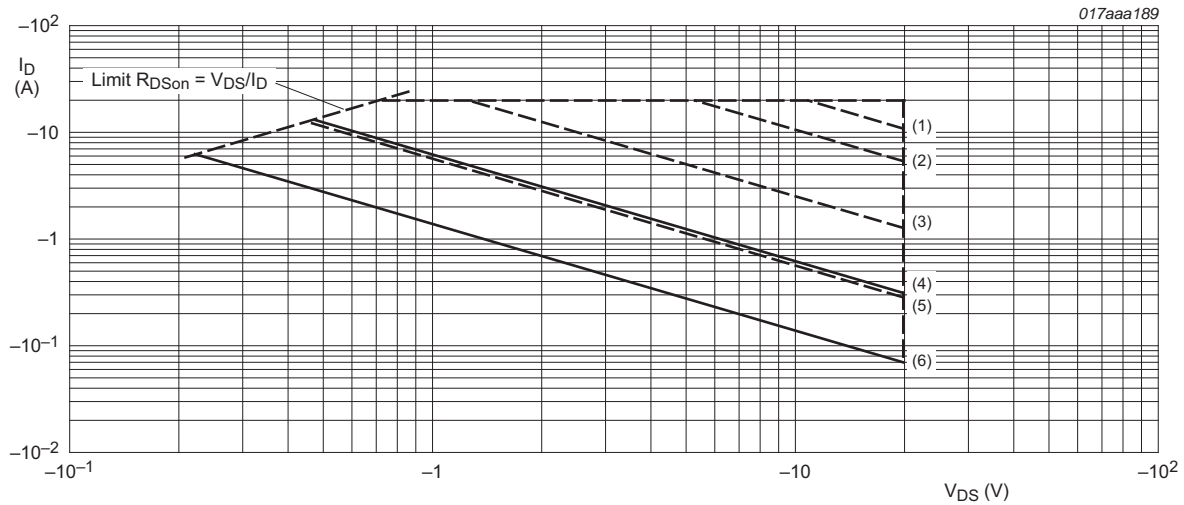
$$P_{der} = \frac{P_{tot}}{P_{tot(25^{\circ}\text{C})}} \times 100 \%$$

**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

- (1)  $t_p = 100 \mu\text{s}$
- (2)  $t_p = 1 \text{ ms}$
- (3)  $t_p = 10 \text{ ms}$
- (4) DC;  $T_{sp} = 25^{\circ}\text{C}$
- (5)  $t_p = 100 \text{ ms}$
- (6) DC;  $T_{amb} = 25^{\circ}\text{C}$ ; drain mounting pad  $6 \text{ cm}^2$

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

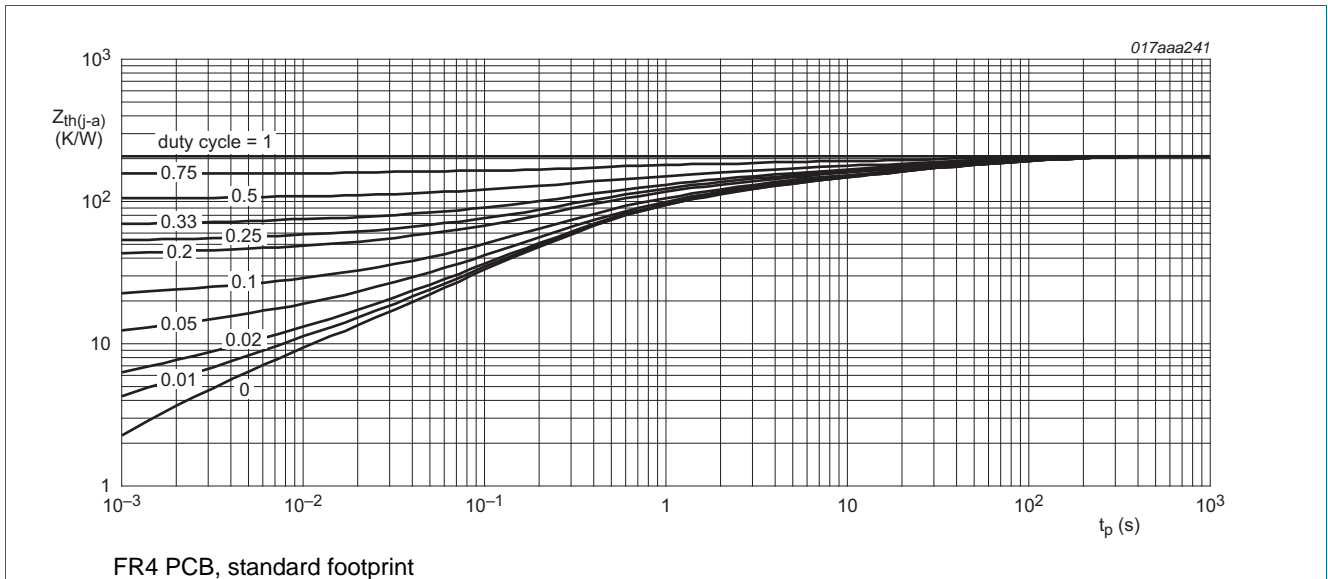
## 6. Thermal characteristics

**Table 6. Thermal characteristics**

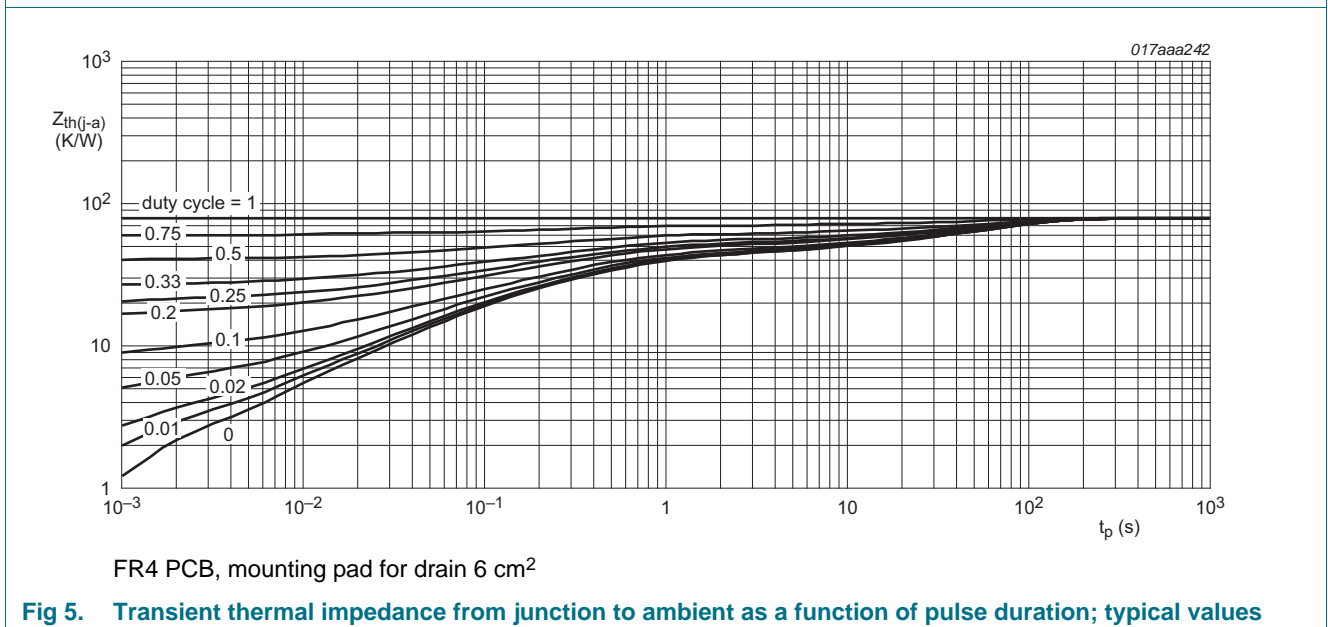
Symbol	Parameter	Conditions	Min	Typ	Max	Unit	
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1]	-	200	230	K/W
			[2]	-	78	90	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point		-	12	20	K/W	

[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 cm<sup>2</sup>.



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



**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	$I_D = -250 \mu\text{A}$ ; $V_{GS} = 0 \text{ V}$ ; $T_j = 25 \text{ }^\circ\text{C}$	-20	-	-	V
$V_{GSth}$	gate-source threshold voltage	$I_D = -250 \mu\text{A}$ ; $V_{DS} = V_{GS}$ ; $T_j = 25 \text{ }^\circ\text{C}$	-0.45	-0.7	-0.95	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
$R_{DSon}$	drain-source on-state resistance	$V_{GS} = -4.5 \text{ V}$ ; $I_D = -2.4 \text{ A}$ ; $T_j = 25 \text{ }^\circ\text{C}$	-	27	32	m $\Omega$
		$V_{GS} = -4.5 \text{ V}$ ; $I_D = -2.4 \text{ A}$ ; $T_j = 150 \text{ }^\circ\text{C}$	-	41	48	m $\Omega$
		$V_{GS} = -2.5 \text{ V}$ ; $I_D = -2.0 \text{ A}$ ; $T_j = 25 \text{ }^\circ\text{C}$	-	36	41	m $\Omega$
		$V_{GS} = -1.8 \text{ V}$ ; $I_D = -1.8 \text{ A}$ ; $T_j = 25 \text{ }^\circ\text{C}$	-	57	66	m $\Omega$
$g_{fs}$	forward transconductance	$V_{DS} = -5 \text{ V}$ ; $I_D = -2.4 \text{ A}$ ; $T_j = 25 \text{ }^\circ\text{C}$	-	14	-	S
<b>Dynamic characteristics</b>						
$Q_{G(tot)}$	total gate charge	$V_{DS} = -10 \text{ V}$ ; $I_D = -1 \text{ A}$ ; $V_{GS} = -4.5 \text{ V}$ ; $T_j = 25 \text{ }^\circ\text{C}$	-	21	31	nC
$Q_{GS}$	gate-source charge		-	4.2	-	nC
$Q_{GD}$	gate-drain charge		-	2.8	-	nC
$C_{iss}$	input capacitance	$V_{DS} = -10 \text{ V}$ ; $f = 1 \text{ MHz}$ ; $V_{GS} = 0 \text{ V}$ ; $T_j = 25 \text{ }^\circ\text{C}$	-	2340	-	pF
$C_{oss}$	output capacitance		-	210	-	pF
$C_{rss}$	reverse transfer capacitance		-	150	-	pF
$t_{d(on)}$	turn-on delay time	$V_{DS} = -10 \text{ V}$ ; $V_{GS} = -4.5 \text{ V}$ ; $R_{G(ext)} = 6 \text{ }^\circ\Omega$ ; $T_j = 25 \text{ }^\circ\text{C}$ ; $I_D = -1 \text{ A}$	-	19	-	ns
$t_r$	rise time		-	20	-	ns
$t_{d(off)}$	turn-off delay time		-	95	-	ns
$t_f$	fall time		-	27	-	ns
<b>Source-drain diode</b>						
$V_{SD}$	source-drain voltage	$I_S = -2.4 \text{ A}$ ; $V_{GS} = 0 \text{ V}$ ; $T_j = 25 \text{ }^\circ\text{C}$	-	-0.75	-1	V

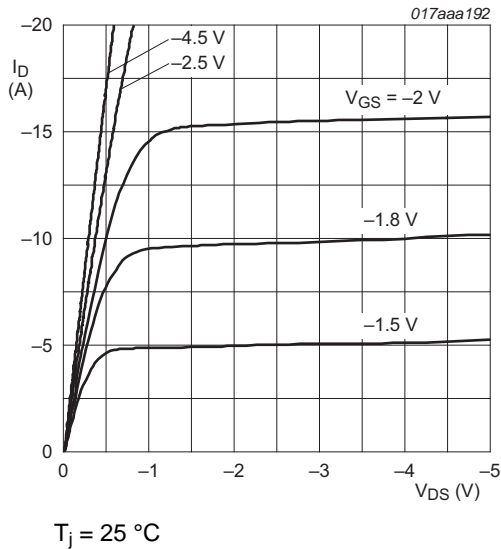


Fig 6. Output characteristics: drain current as a function of drain-source voltage; typical values

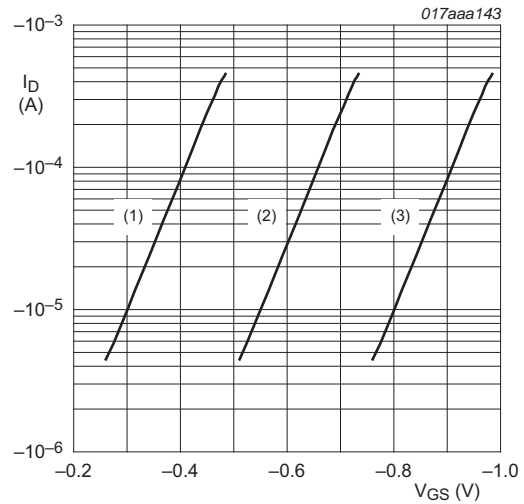


Fig 7. Sub-threshold drain current as a function of gate-source voltage

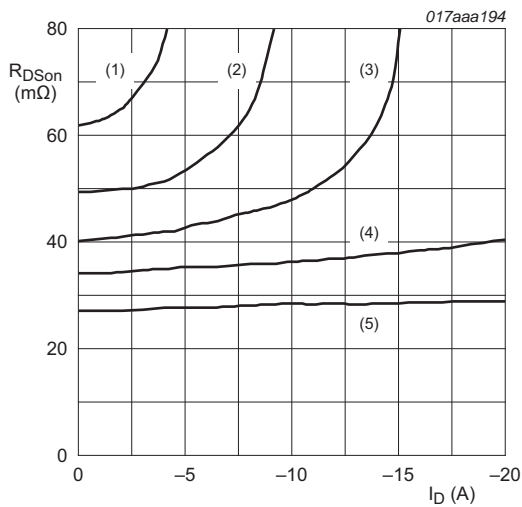


Fig 8. Drain-source on-state resistance as a function of drain current; typical values

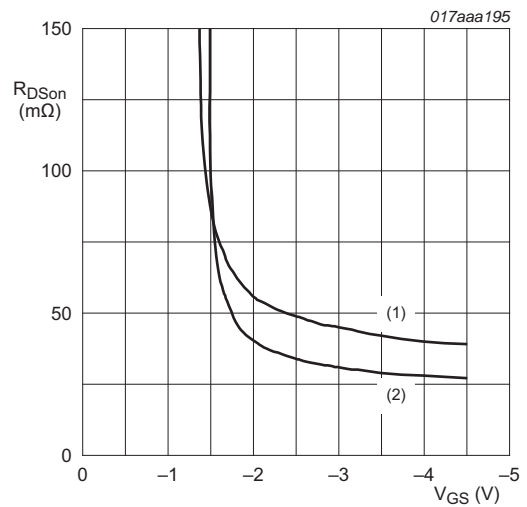
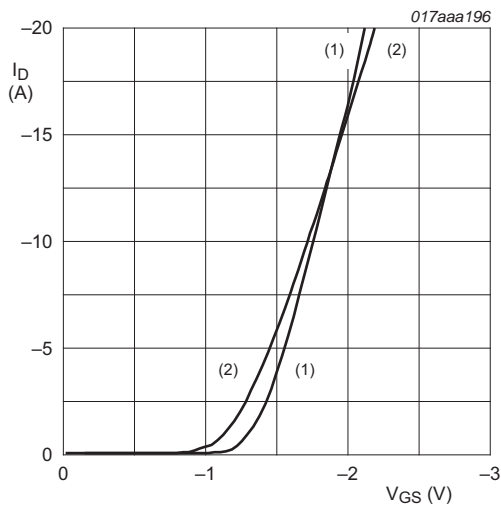
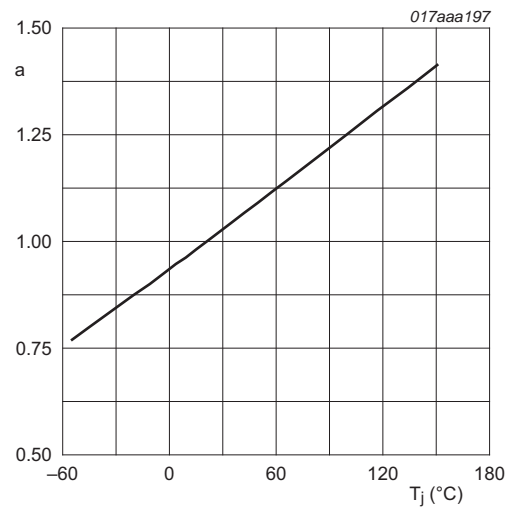


Fig 9. Drain-source on-state resistance as a function of gate-source voltage; typical values



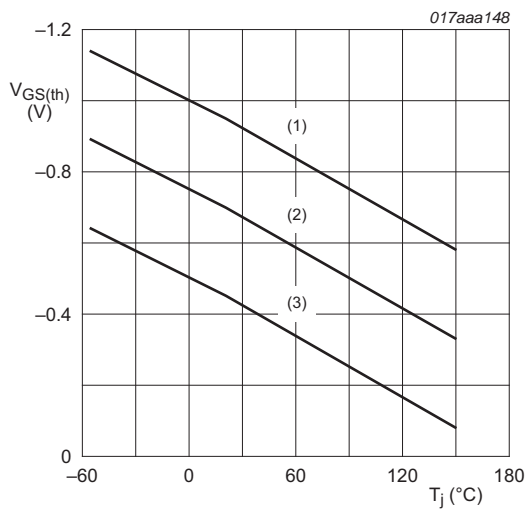
$V_{DS} > I_D \times R_{DS(on)}$   
 (1)  $T_j = 25\text{ °C}$   
 (2)  $T_j = 150\text{ °C}$

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



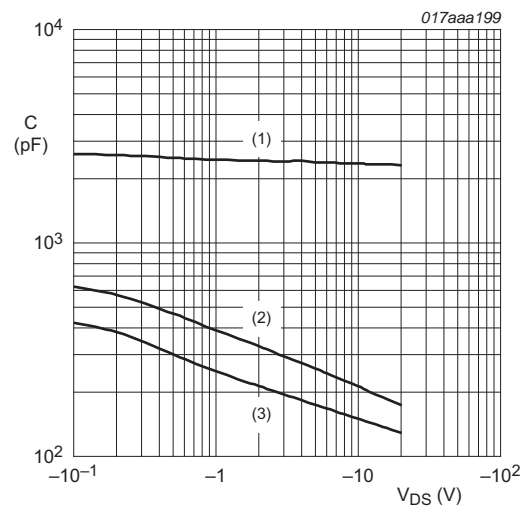
$$a = \frac{R_{DS(on)}}{R_{DS(on)@25^\circ\text{C}}}$$

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



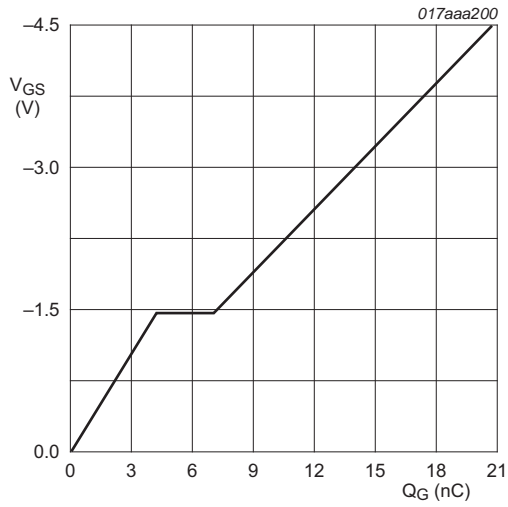
$I_D = -0.25\text{ mA}; V_{DS} = V_{GS}$   
 (1) maximum values  
 (2) typical values  
 (3) minimum values

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



$f = 1\text{ MHz}; V_{GS} = 0\text{ V}$   
 (1)  $C_{iss}$   
 (2)  $C_{oss}$   
 (3)  $C_{rss}$

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



$I_D = -2.4 \text{ A}; V_{DS} = -10 \text{ V}; T_{amb} = 25 \text{ }^\circ\text{C}$

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

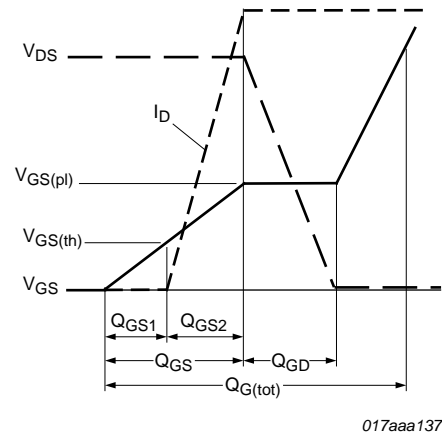
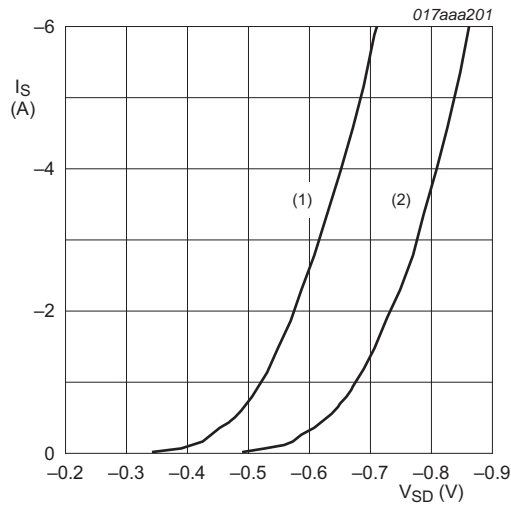


Fig 15. Gate charge waveform definitions



$V_{GS} = 0 \text{ V}$   
 (1)  $T_j = 150 \text{ }^\circ\text{C}$   
 (2)  $T_j = 25 \text{ }^\circ\text{C}$

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



## 8. Test information

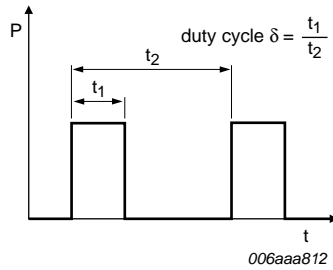


Fig 17. Duty cycle definition

9. Package outline

Plastic surface-mounted package (TSOP6); 6 leads

SOT457

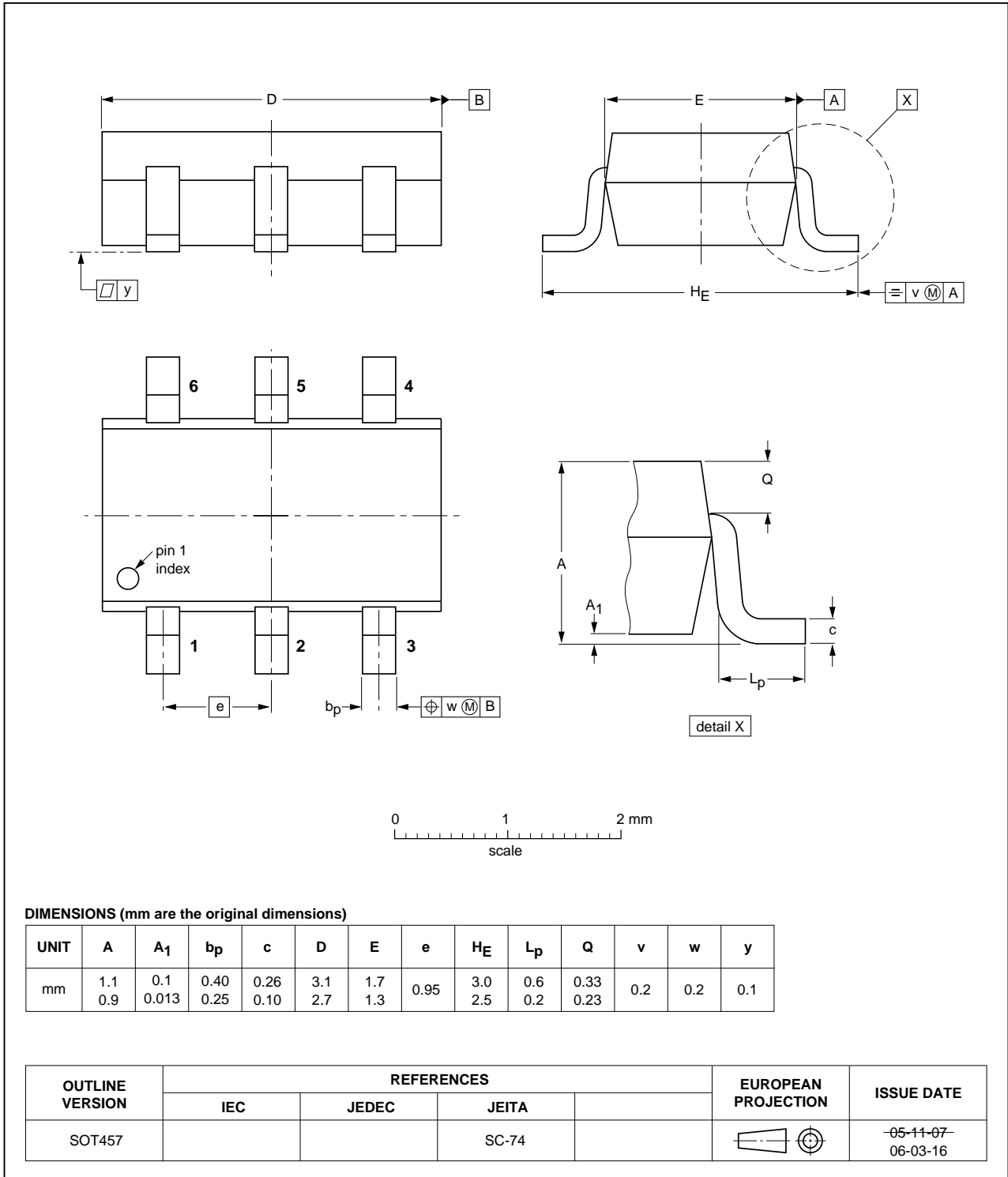


Fig 18. Package outline SOT457 (TSOP6)

### 10. Soldering

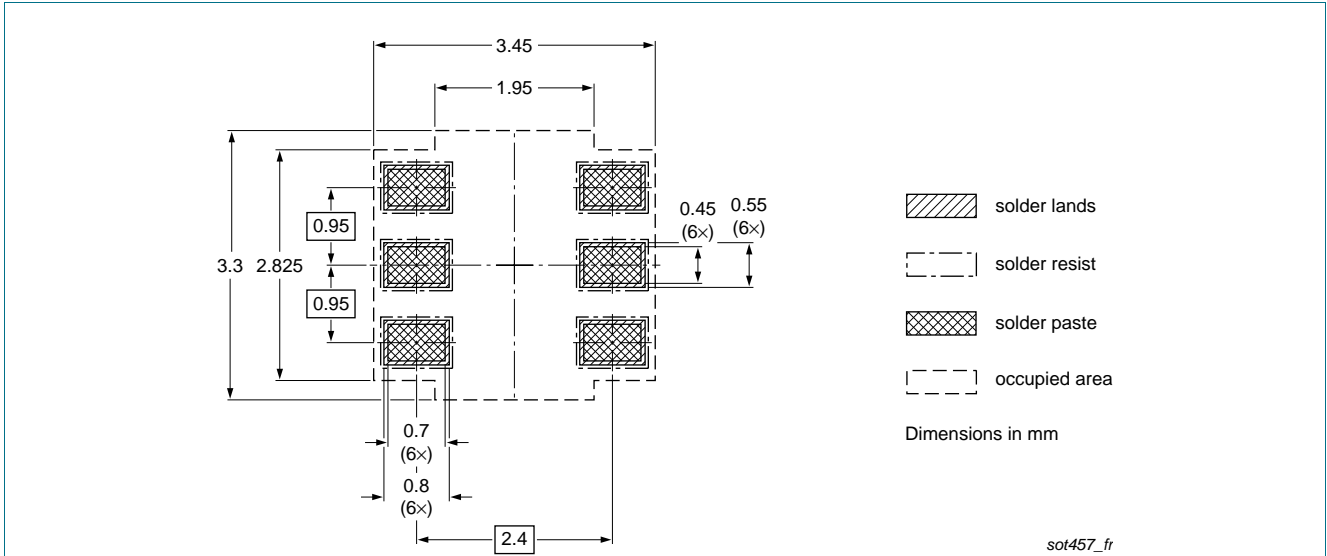


Fig 19. Reflow soldering footprint for SOT457 (TSOP6)

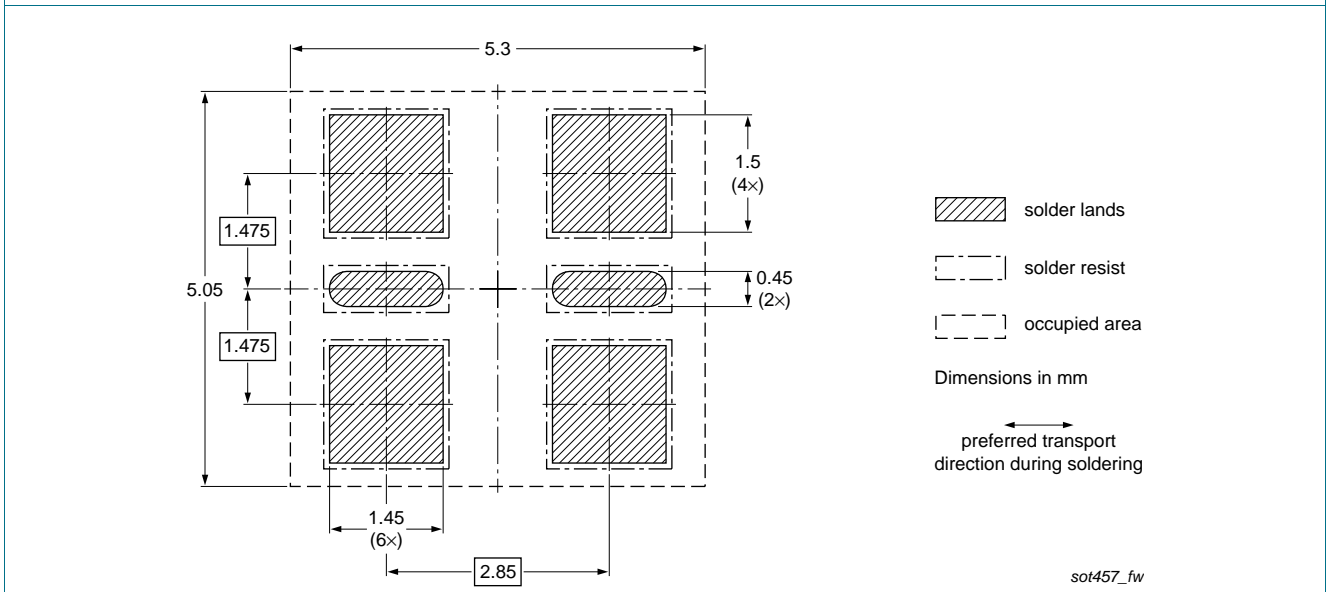


Fig 20. Wave soldering footprint for SOT457 (TSOP6)

## 11. Revision history

Table 8. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
PMN27UP v.1	20110713	Product data sheet	-	-

## 12. Legal information

### 12.1 Data sheet status

Document status <sup>[1]</sup> <sup>[2]</sup>	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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## 14. Contents

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<b>1</b>	<b>Product profile</b> . . . . .	<b>1</b>
1.1	General description . . . . .	1
1.2	Features and benefits . . . . .	1
1.3	Applications . . . . .	1
1.4	Quick reference data . . . . .	1
<b>2</b>	<b>Pinning information</b> . . . . .	<b>1</b>
<b>3</b>	<b>Ordering information</b> . . . . .	<b>2</b>
<b>4</b>	<b>Marking</b> . . . . .	<b>2</b>
<b>5</b>	<b>Limiting values</b> . . . . .	<b>2</b>
<b>6</b>	<b>Thermal characteristics</b> . . . . .	<b>4</b>
<b>7</b>	<b>Characteristics</b> . . . . .	<b>5</b>
<b>8</b>	<b>Test information</b> . . . . .	<b>9</b>
<b>9</b>	<b>Package outline</b> . . . . .	<b>10</b>
<b>10</b>	<b>Soldering</b> . . . . .	<b>11</b>
<b>11</b>	<b>Revision history</b> . . . . .	<b>12</b>
<b>12</b>	<b>Legal information</b> . . . . .	<b>13</b>
12.1	Data sheet status . . . . .	13
12.2	Definitions . . . . .	13
12.3	Disclaimers . . . . .	13
12.4	Trademarks . . . . .	14
<b>13</b>	<b>Contact information</b> . . . . .	<b>14</b>

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