



## STEVAL-TDR001V1

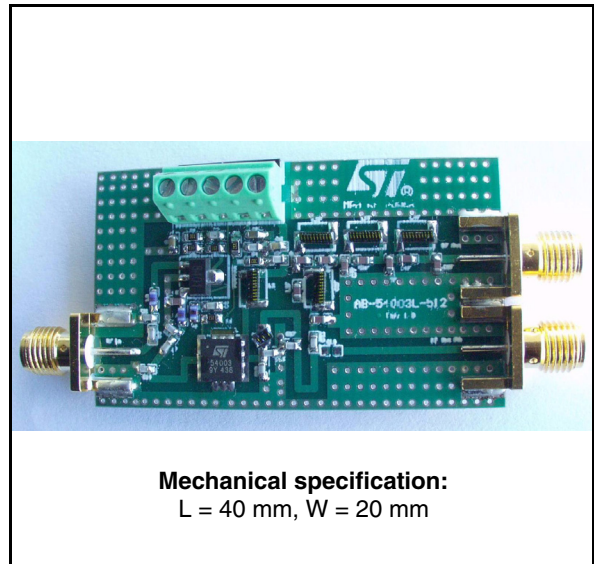
2 stage RF power amp: PD84001 + PD54003L-E + LPF  
N-channel enhancement-mode lateral MOSFETs

### Feature

- Excellent thermal stability
- Frequency: 380 - 512 MHz
- Supply voltage: 7.2 V
- Output power: 4 W
- Current < 1.6 A
- Input power < 10 dBm
- Harmonics level < -70 dBc
- Load mismatch 20:1
- $V_{APC}$  5 V max
- Beo free amplifier
- RoHS compliant

### Description

The STEVAL-TDR001V1 is a two stage RF power amplifier which includes a low pass output filter for harmonics rejection specifically designed for portable two-way UHF radio communication.



**Table 1. Device summary**

Order code
STEVAL-TDR001V1

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# 1 Electrical data

## 1.1 Maximum ratings

**Table 2. Absolute maximum ratings**

Symbol	Parameter	Value	Unit
$V_{DD}$	Supply voltage	15	V
$I_D$	Drain current	2.5	A
$T_{CASE}$	Operating case temperature	-20 to +85	°C
$T_A$	Max. ambient temperature	+55	°C

## 2 Electrical characteristics

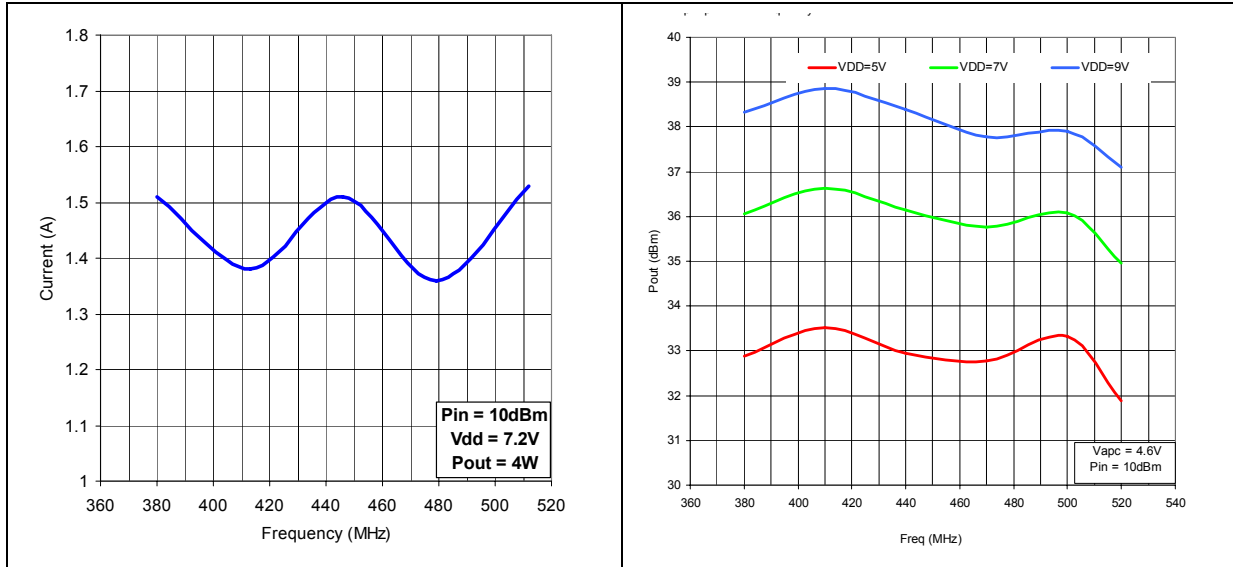
$T_A = +25\text{ °C}$ ,  $V_{DD} = 7.2\text{ V}$ ,  $V_{APC}$  adjusted

**Table 3. Electrical specification**

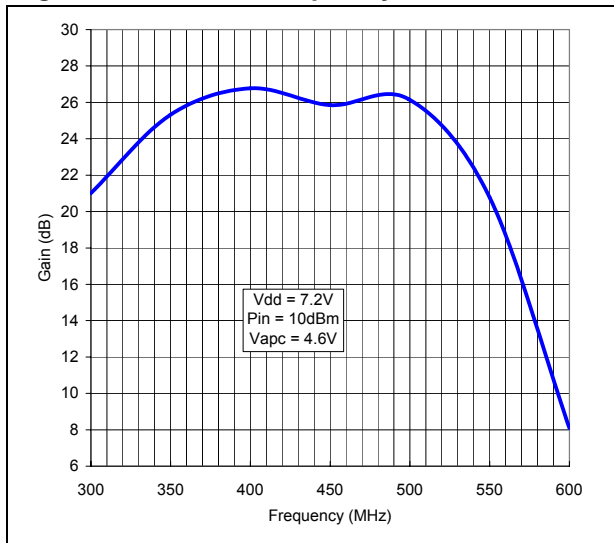
Symbol	Test conditions	Min.	Typ.	Max.	Unit
Freq.	Frequency range	380		512	MHz
$P_{IN}$	@ $P_{OUT} = 4\text{ W}$		10		dBm
$I_{TOTAL}$	@ $P_{OUT} = 4\text{ W}$ and $P_{IN} = 10\text{ dBm}$			1.6	A
PAE	@ $P_{OUT} = 4\text{ W}$ and $P_{IN} = 10\text{ dBm}$	36% - 40%			
VAPC	@ $P_{OUT} = 4\text{ W}$ and $P_{IN} = 10\text{ dBm}$		4.5	5	V
Harmonics	@ $P_{OUT} = 4\text{ W}$			-70	dBc

### 3 Typical performance

**Figure 1. Current consumption vs frequency**      **Figure 2. Output power vs frequency**



**Figure 3. Gain vs frequency**



**Figure 4. Input return loss vs frequency**

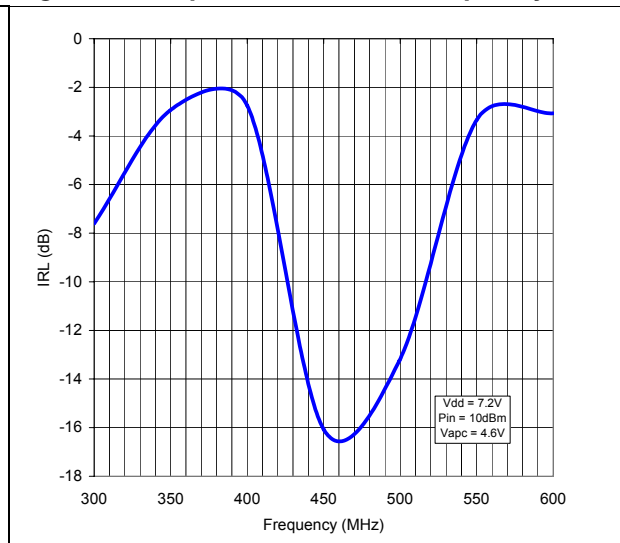


Figure 5. Low pass filter - insertion loss

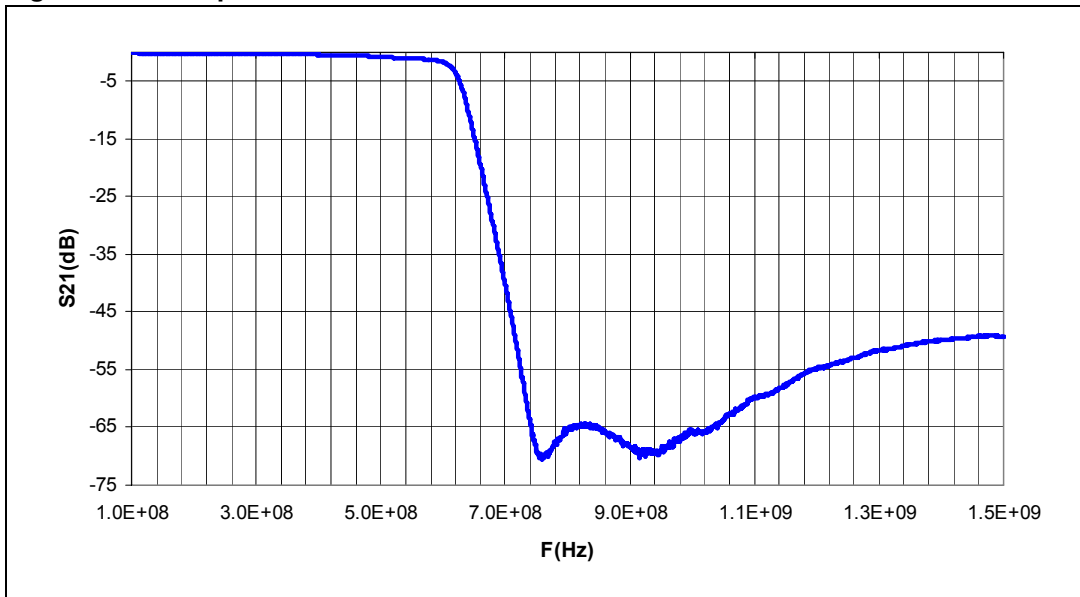


Figure 6. Low pass filter - input return loss

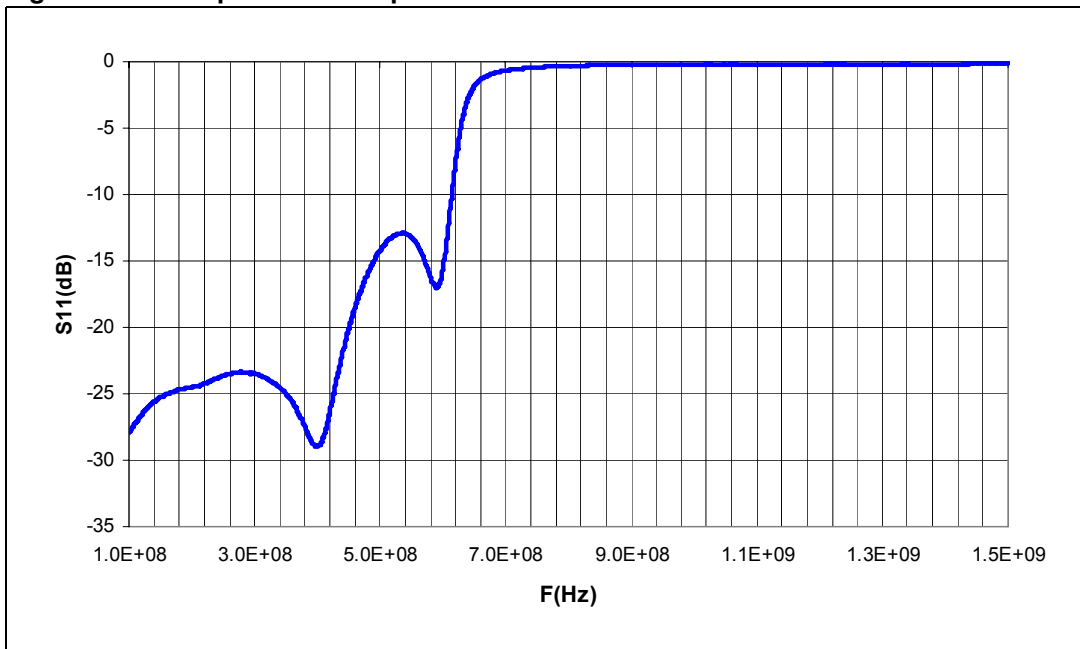
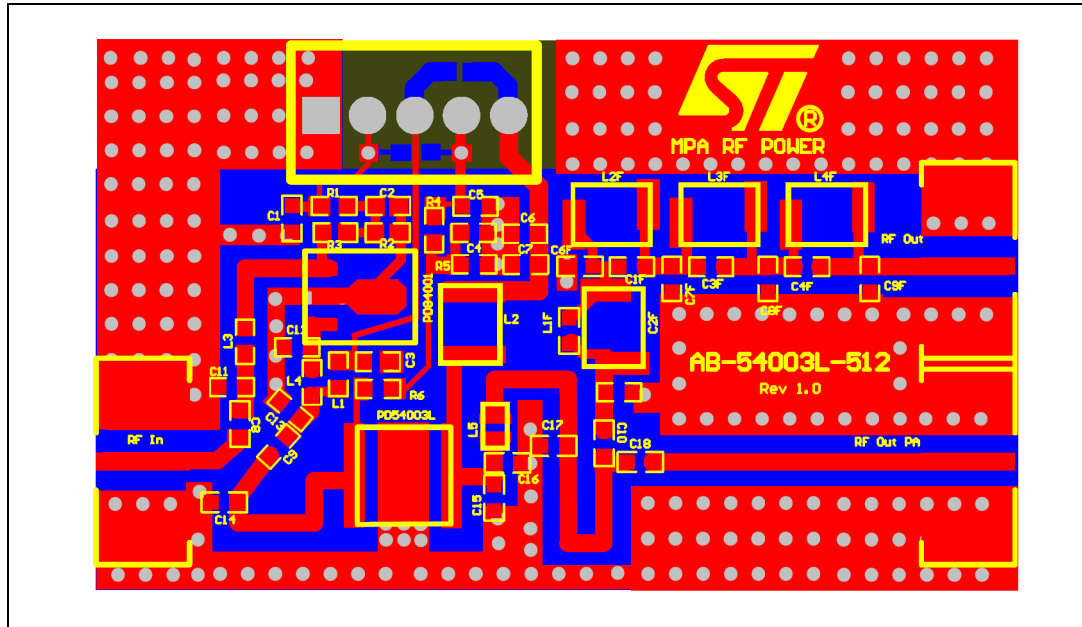


Table 4. Part list

Designator	Value	Quantity	Manufacturer	Part code	Size
C1	1 $\mu$ F	1	Murata	GRM1885F51C105ZA01	603
C1F	2.2 pF	1	Murata	GRM1885C1H2R2CZ01	603
C2, C3, C4	120 pF	3	Murata	GRM1885C1H121JA01	603
C2F, C3F	3.3 pF	2	Murata	GRM1885C1H3R3CZ01	603
C4F, C5F	2.2 pF	2	Murata	GRM1885C1H2R2CZ01	603
C5, C6	1 $\mu$ F	2	Murata	GRM1885F51C105ZA01	603
C6F	4.7 pF	1	Murata	GRM1885C1H4R7CZ01	603
C7	120 nF	1	Murata	GRM1885C1H121JA01	603
C7F, C8F	3.9 pF	2	Murata	GRM1885C1H3R9CZ01	603
C8, C10	470 pF	2	Murata	GRM1885C1H471JA01	603
C9	470 pF	1	Murata	GRM1885C1H471JA01	603
C9F	1.2 pF	1	Murata	GRM1885C1H1R2CZ01	603
C11	15 pF	1	Murata	GRM1885C1H150JA01	603
C12	4.7 pF	1	Murata	GRM1885C1H4R7CZ01	603
C13	18 pF	1	Murata	GRM1885C1H180JA01	603
C14	39 pF	1	Murata	GRM1885C1H390JA01	603
C15, C16	18 pF	2	Murata	GRM1885C1H180JA01	603
C17	15 pF	1	Murata	GRM1885C1H150JA01	603
C18	NC	1	Murata	GRM1885C1H471JA01	603
DC-Con		1	Phoenix contact	1725685	2.54mm, 5 poli
L1	24 nH	1	Coilcraft	0603HC-24NX_BW	603
L1F, L2, L2F, L3F, L4F	12.55 nH	5	Coilcraft	1606-10_, 1606_10	1606
L3, L4	3.6 nH	2	Coilcraft	0603HC-3N6X_BW	603
L5	2.55 nH	1	Coilcraft	0906-3_	906
PD54003L-E		1	STMicroelectronics	PD54003L-E	
PD84001		1	STMicroelectronics	PD84001	
R1	300 $\Omega$	1	Tyco/electronics neohn	CRG series thick film chip	603
R2, R5	3 k $\Omega$	2	Tyco/electronics neohn	CRG series thick film chip	603
R3, R6	15 k $\Omega$	2	Tyco/electronics neohn	CRG series thick film chip	603
R4	1.5 k $\Omega$	1	Tyco/electronics neohn	CRG series thick film chip	603
RF In, RF Out, RF Out PA		3			
SUB		1		FR-4	H=20 mil h=10 oz
TL1	50	1			L=6.88 mm W=0.92 mm
TL2	50	1			L=9.8 mm W=0.92 mm
TL3		1			L=9.8 mm W=0.92 mm
TL4		1			50 $\Omega$

## 4 Circuit layout

Figure 7. Test fixture component layout



# 5 Circuit schematic

Figure 8. Circuit schematic

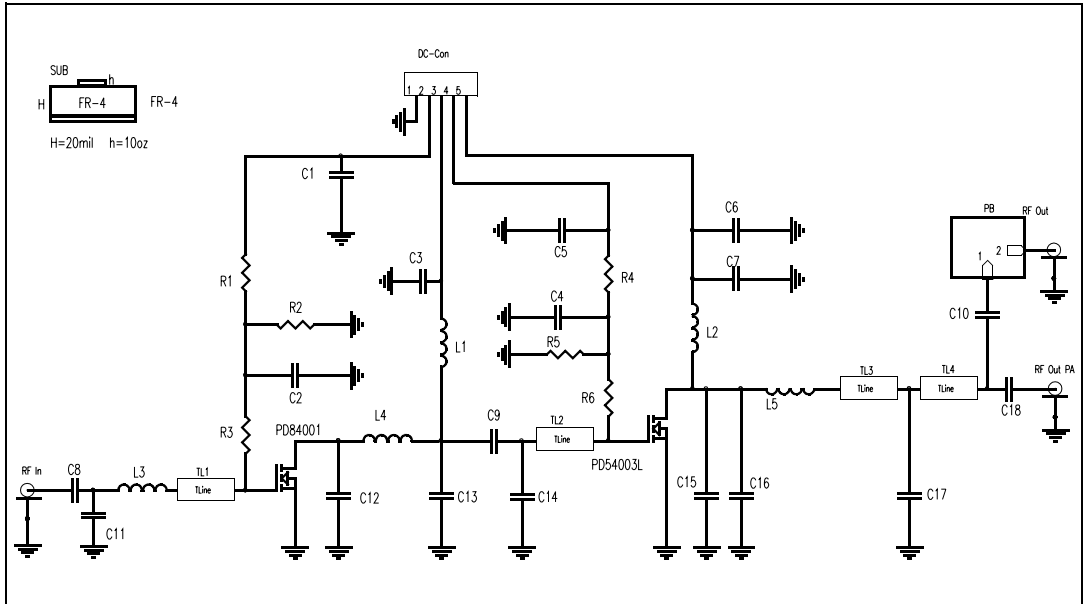
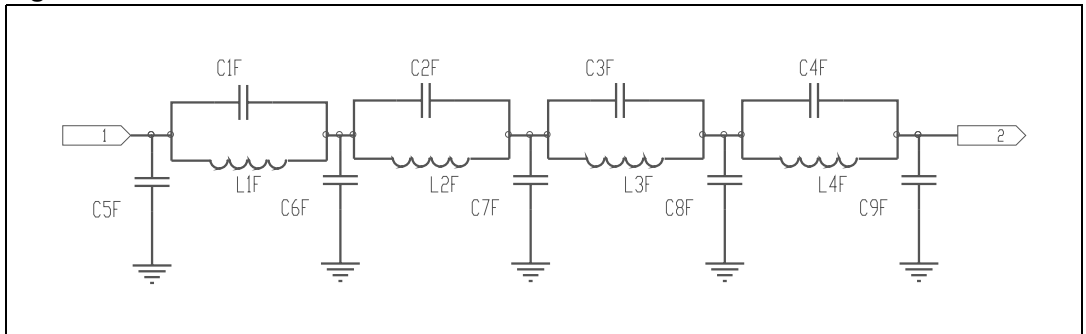


Figure 9. Filter schematic





## 6 Package mechanical data

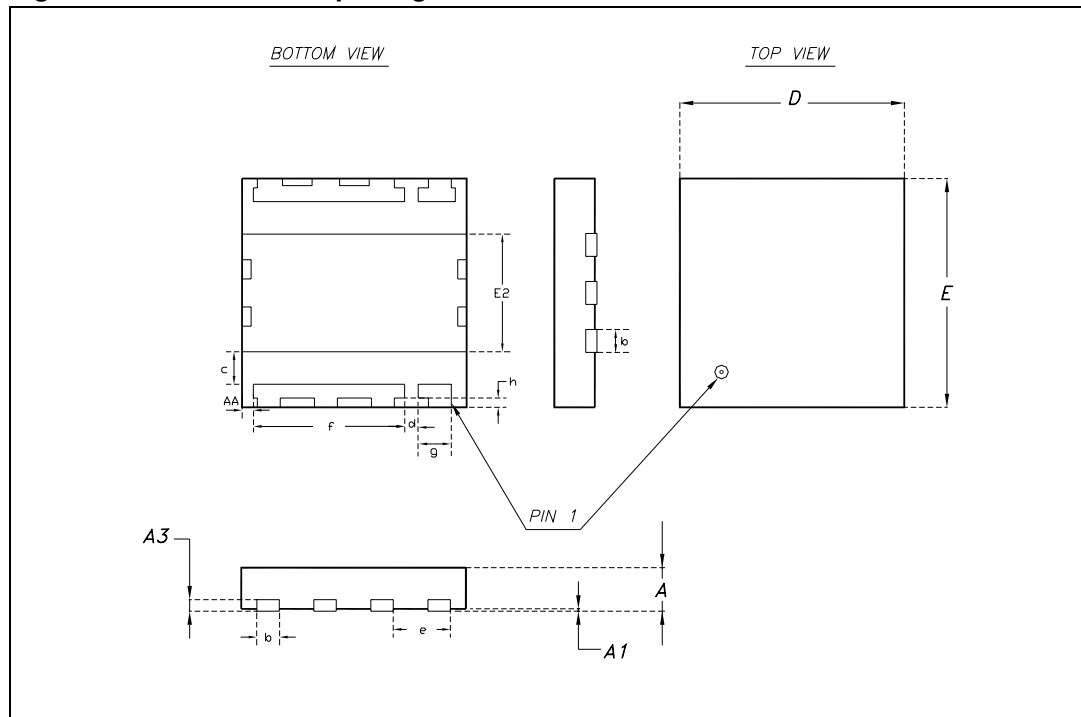
In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK® packages, depending on their level of environmental compliance. ECOPACK® specifications, grade definitions and product status are available at: [www.st.com](http://www.st.com). ECOPACK is an ST trademark.

### 6.1 PowerFLAT™ mechanical data

Table 5. PowerFLAT™ mechanical data

Dim.	mm			inch		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A		0.90	1.00		0.035	0.039
A1		0.02	0.05		0.001	0.002
A3		0.24			0.009	
AA	0.15	0.25	0.35	0.006	0.01	0.014
b	0.43	0.51	0.58	0.017	0.020	0.023
c	0.64	0.71	0.79	0.025	0.028	0.031
D		5.00			0.197	
d		0.30			0.011	
E		5.00			0.197	
E2	2.49	2.57	2.64	0.098	0.101	0.104
e		1.27			0.050	
f		3.37			0.132	
g		0.74			0.03	
h		0.21			0.008	

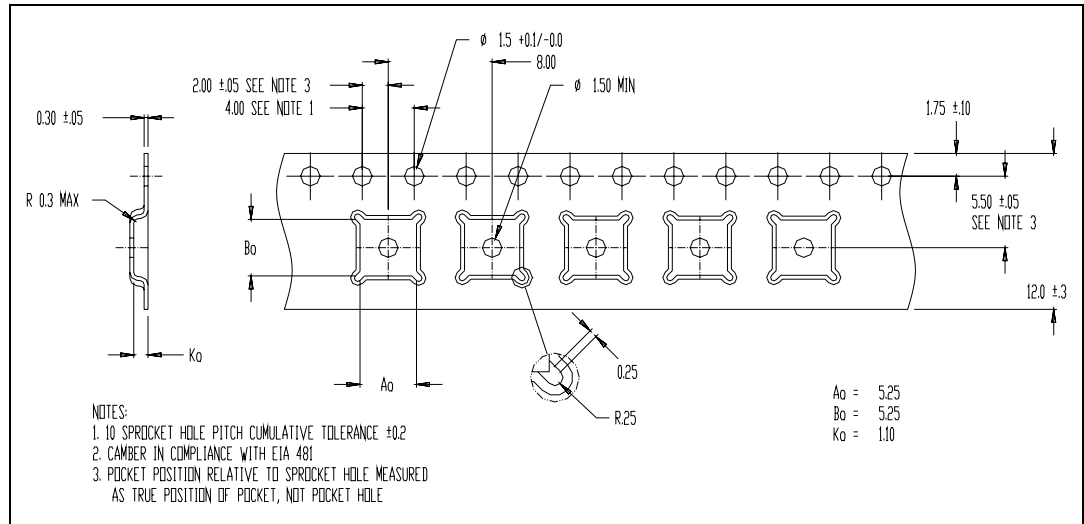
Figure 10. PowerFLAT™ package dimensions



**Table 6. PowerFLAT™ tape and reel dimensions**

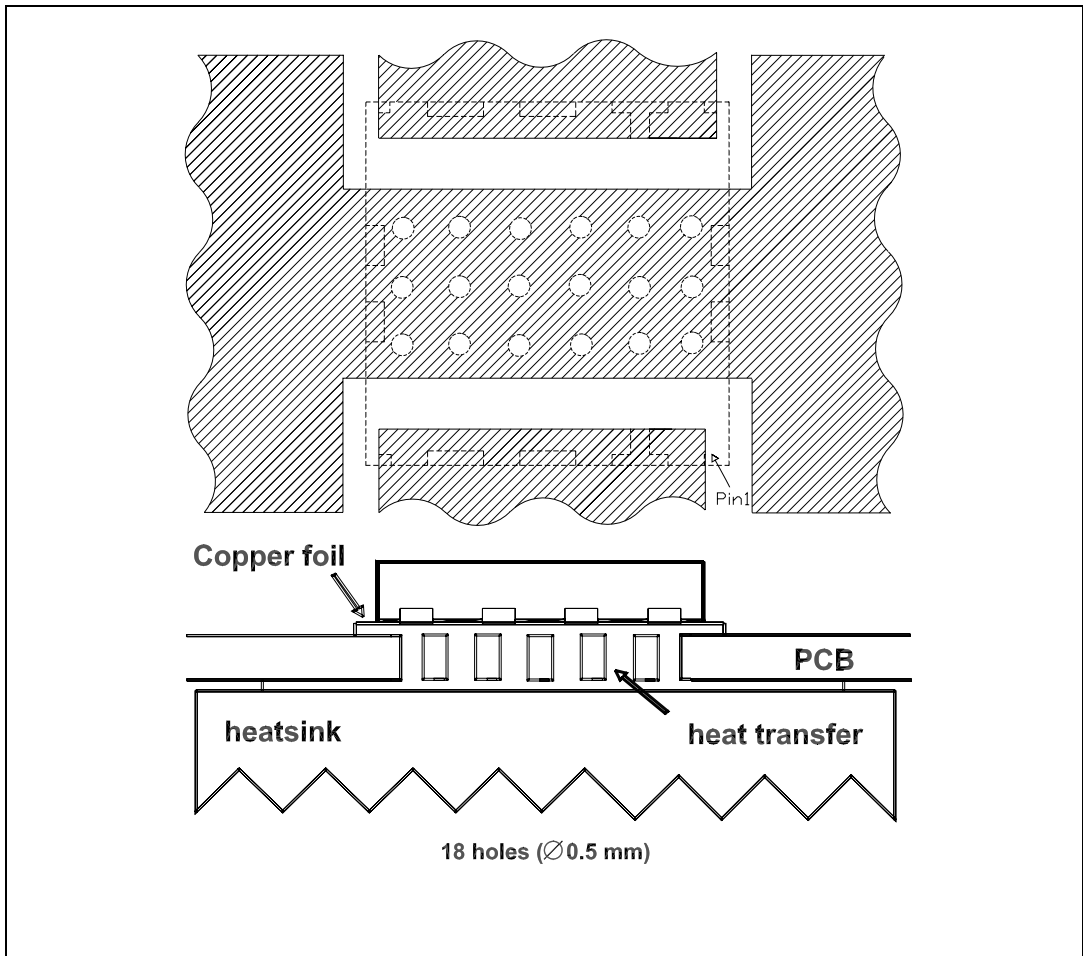
Dim.	mm.			inch		
	Min.	Typ	Max.	Min.	Typ	Max.
Ao	5.15	5.25	5.35	0.12	0.13	0.13
Bo	5.15	5.25	5.35	0.12	0.13	0.13
Ko	1.0	1.1	1.2	0.02	0.02	0.02

**Figure 11. PowerFLAT™ tape and reel**



### 6.1.1 Mounting indications

Figure 12. Standard SMD mounting

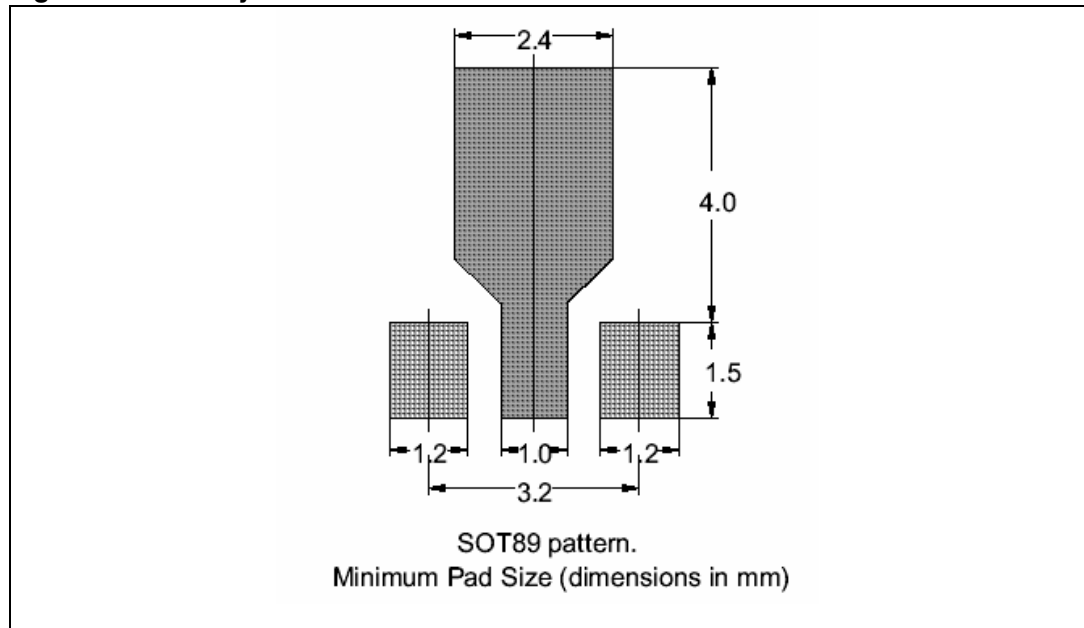


## 6.2 Thermal pad and via design SOT-89

Thermal vias are required in the PCB layout to effectively conduct heat away from the package. The via pattern has been designed to address thermal, power dissipation and electrical requirements of the device.

The via pattern is based on thru-hole vias with 0.203 mm to 0.330 mm finished hole size on a 0.5 mm to 1.2 mm grid pattern with 0.025 plating on via walls. If micro vias are used in a design, it is suggested that the quantity of vias be increased by a 4:1 ratio to achieve similar results.

**Figure 13. Pad layout details**



### 6.2.1 Soldering profile

Figure 14 shows the recommended solder for devices that have Pb-free terminal plating and where a Pb-free solder is used.

Figure 14. Recommended solder profile

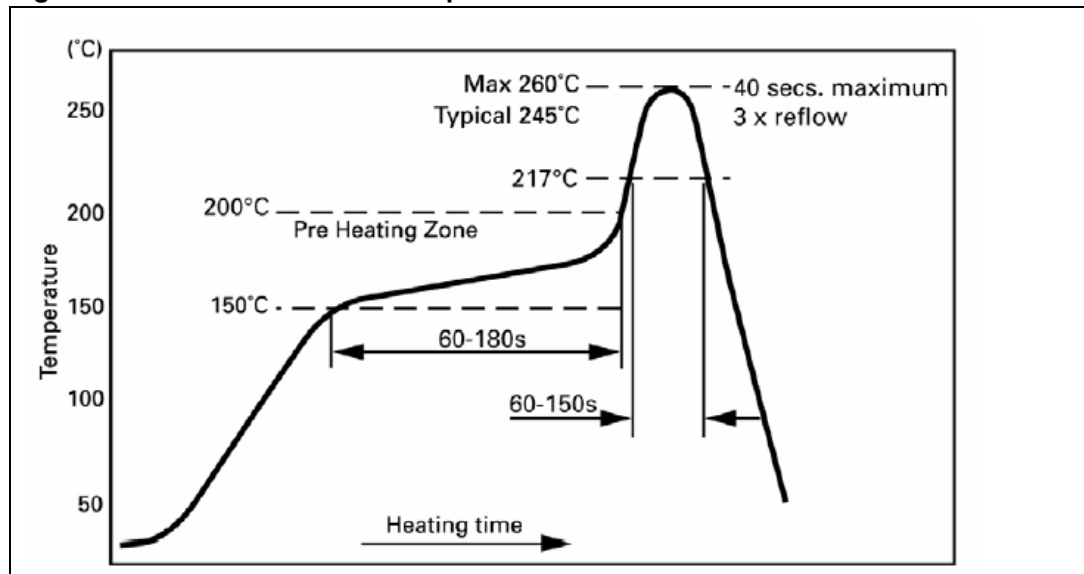


Figure 15 shows the recommended solder for devices with Pb-free terminal plating used with leaded solder, or for devices with leaded terminal plating used with a leaded solder.

Figure 15. Recommended solder profile for leaded devices

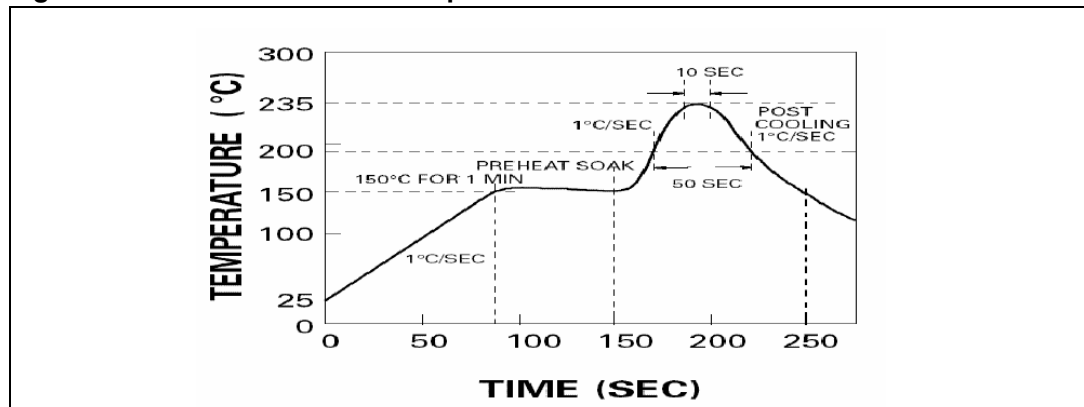
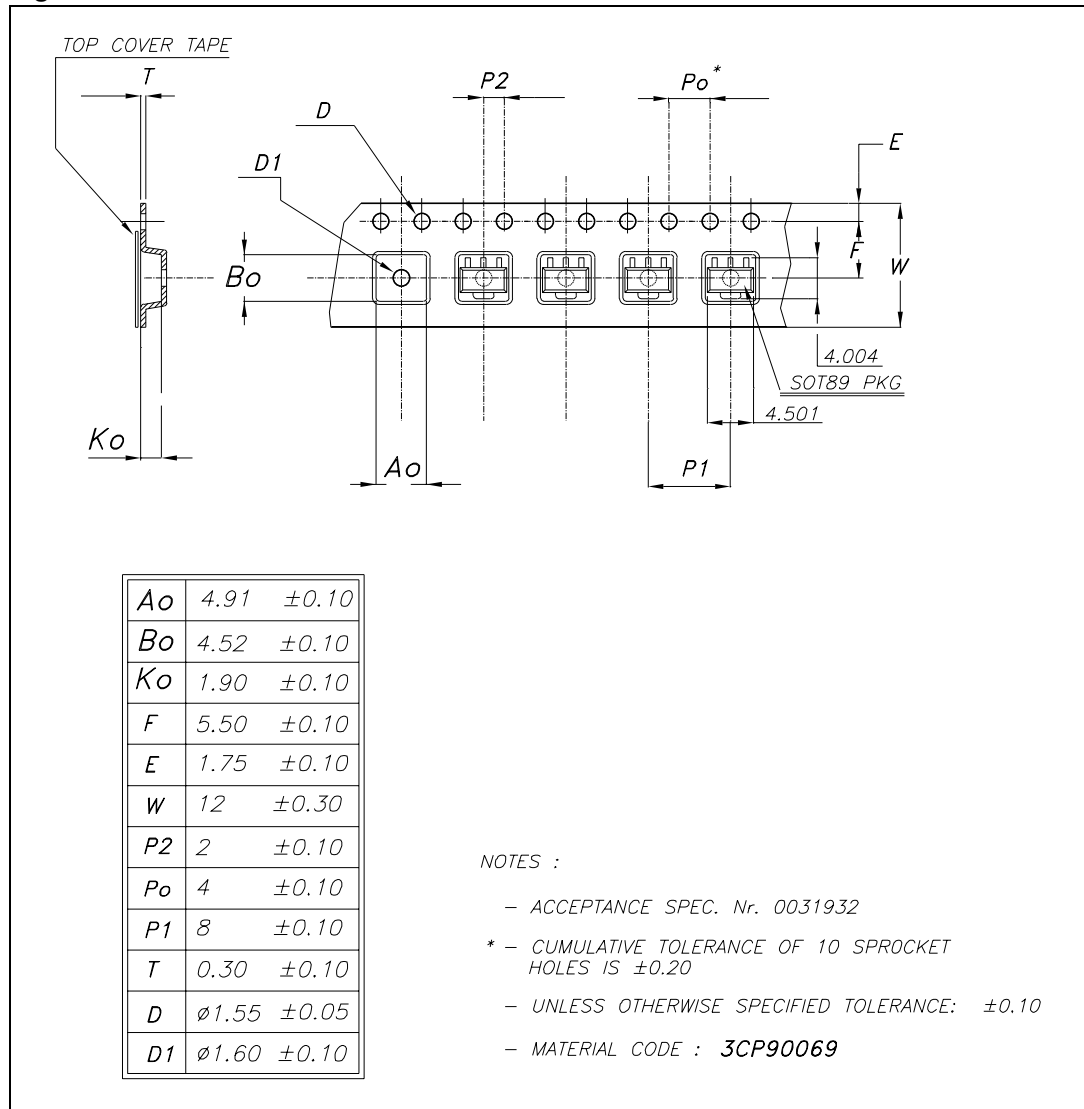


Figure 16. Reel information



## 7 Revision history

**Table 7. Document revision history**

Date	Revision	Changes
16-Mar-2009	1	Initial release.



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