



STEVAL-TDR006V1

2 stage RF power amp: PD84001 + PD84008L-E + LPF
N-channel enhancement-mode lateral MOSFETs

Features

- Excellent thermal stability
- Frequency: 400 - 470 MHz
- Supply voltage: 7.2 V
- Output power: 4 W
- Current < 1.4 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-TDR006V1 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-TDR006V1

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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	400		470	MHz
P_{IN}	@ $P_{OUT} = 4\text{ W}$		10		dBm
I_{TOTAL}	@ $P_{OUT} = 4\text{ W}$ and $P_{IN} = 10\text{ dBm}$			1.4	A
PAE	@ $P_{OUT} = 4\text{ W}$ and $P_{IN} = 10\text{ dBm}$	42% - 45%			
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 performances

Figure 1. Output power and current vs frequency

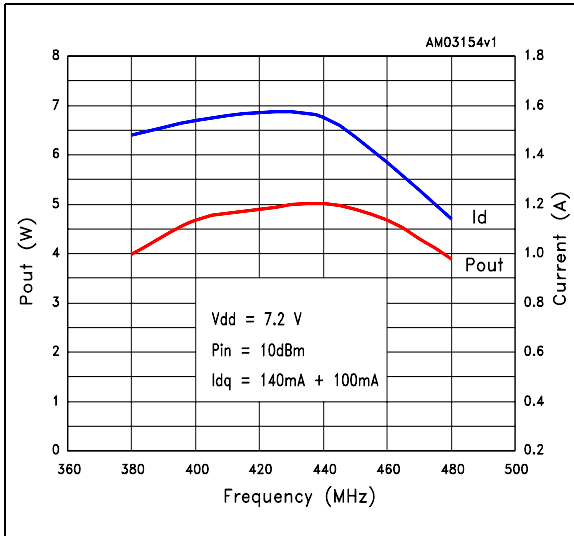


Figure 2. Supply current vs frequency

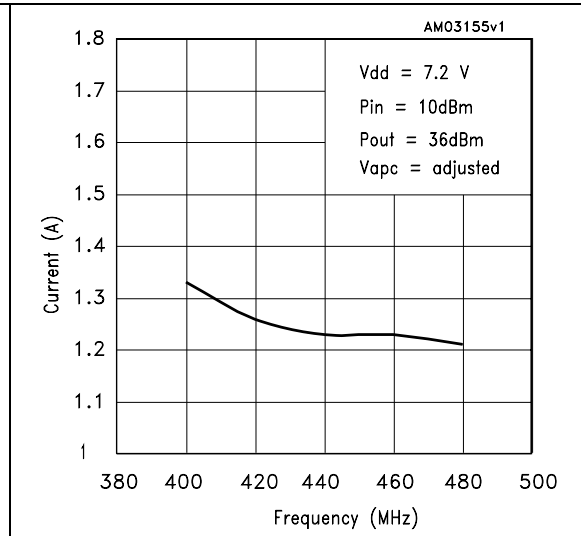


Figure 3. Input return loss vs frequency

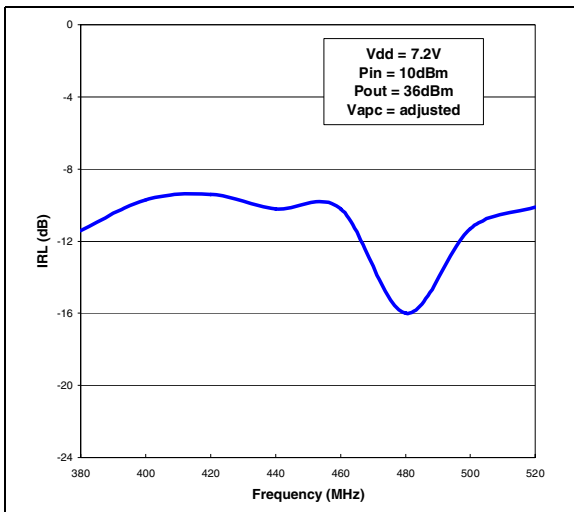


Figure 4. Harmonics vs frequency

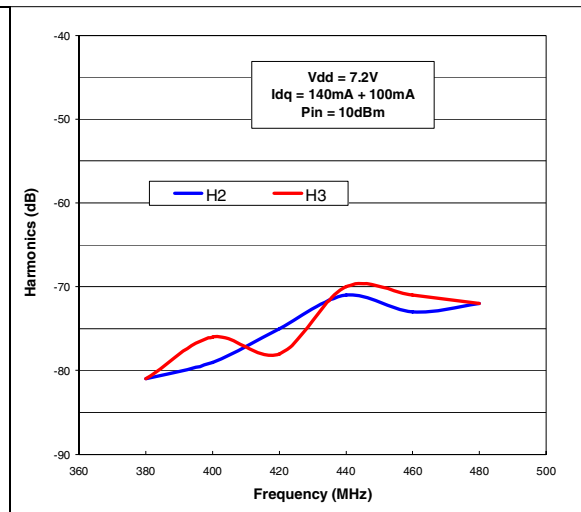


Figure 5. Low pass filter - insertion loss

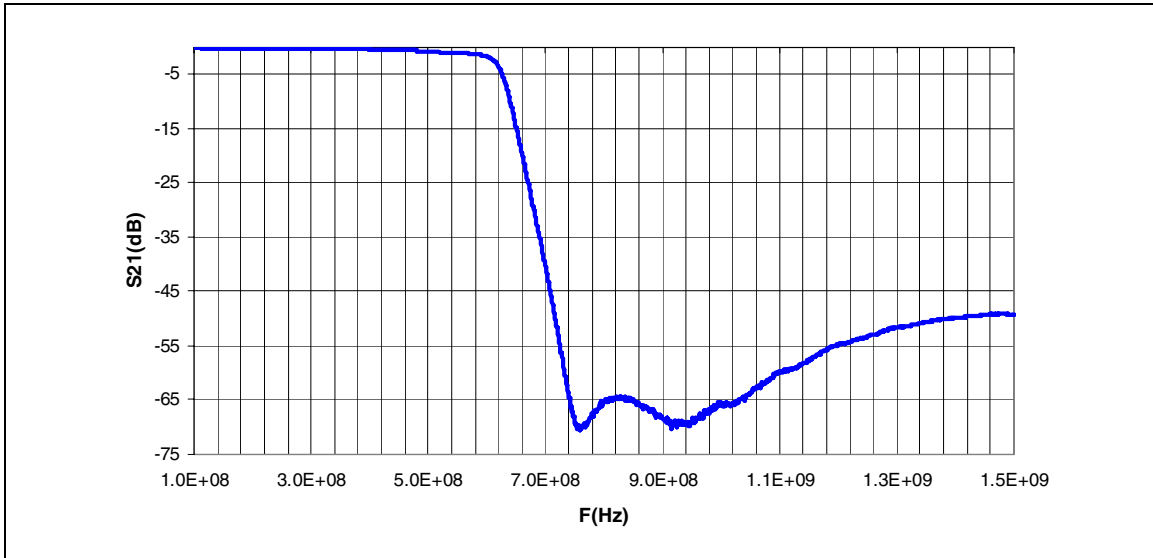


Figure 6. Low pass filter - input return loss

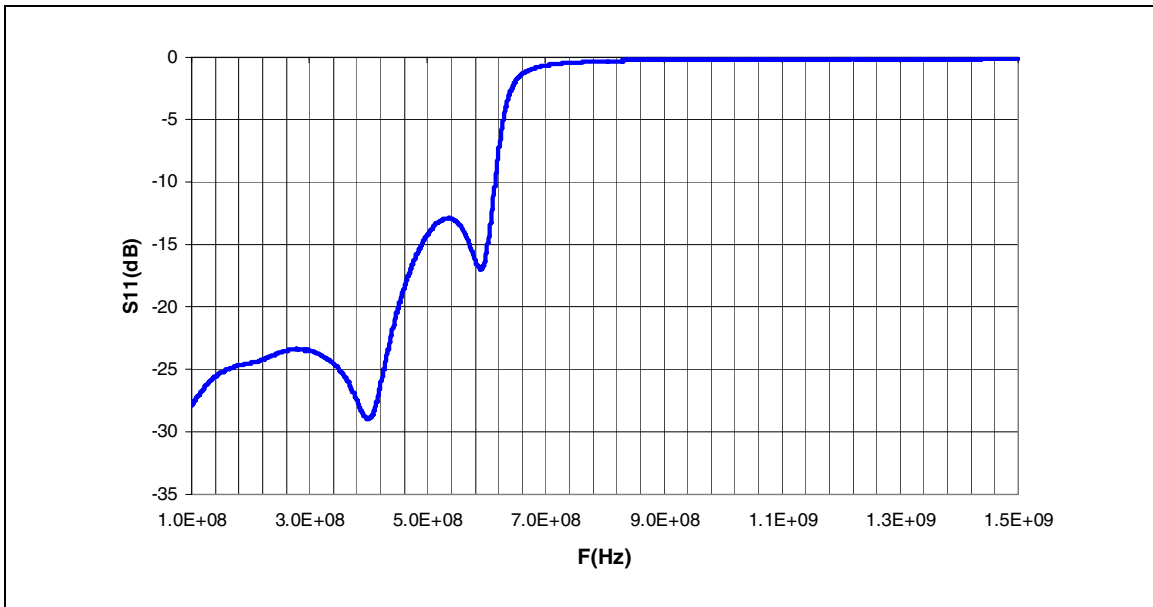


Table 4. Parts list

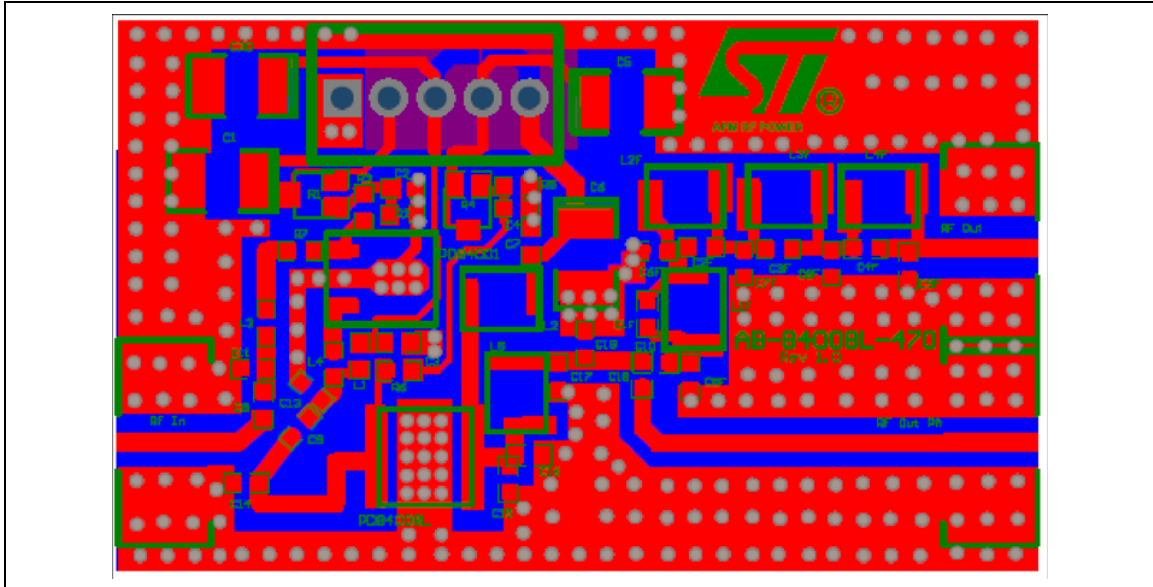
Designator	Value	Quantity	Manufacturer	Part code	Size
C1, C5, C6, C20	1 μ F	4	EPCOS	B45196E6105K209	CASE_B_TANT
C1F	2.2 pF	1	Murata	GRM1885C1H2R2CZ01	603
C2, C3, C4	120 pF	3	Murata	GRM1885C1H121J, GRM1885C1H121JA01	603
C2F, C3F	3.3 pF	2	Murata	GRM1885C1H3R3CZ01	603
C4F, C5F	2.2 pF	2	Murata	GRM1885C1H2R2CZ01	603
C6F	4.7 pF	1	Murata	GRM1885C1H4R7CZ01	603
C7	100 nF	1	Murata	GRM188R71E104K	603
C7F, C8F	3.9 pF	2	Murata	GRM1885C1H3R9CZ01	603
C8, C10	470 pF	2	Murata	GRM1885C1H471J	603
C9	470 pF	1	Murata	GRM1885C1H471J	603
C9F	1.2 pF	1	Murata	GRM1885C1H1R2CZ01	603
C11	9.1 pF	1	Murata	CQM1885C1H9R1D	603
C13	22 pF	1	Murata	GRM1885C1H220J	603
C14	33 pF	1	Murata	GRM1885C1H330J	603
C15, C16	18 pF	2	Murata	CQM1885C1H180J, GQM1885C1H180J	603
C17	8.2 pF	1	Murata	CQM3295C2A8R2D	603
C19	9.1 pF	1	Murata	CQM1885C1H9R1D	603
DC-Con	5 poli	1	Phoenix Contact	1725685	2.54mm, 5 poli
L1	24 nH	1	Coilcraft	0603HC-24NXJLW	603
L1F, L2, L2F, L3F, L4F	12.5 nH	5	Coilcraft	A04TJLB_12.5nH	1606
L3	7.5 nH	1	Coilcraft	0603HC-7N5X_BW	603
L4	1.6 nH	1	Coilcraft	0603HC-1N6XJLW	603
L5	5 nH	1	Coilcraft	A02TJLC_5nH	1606
PD84001	LD MOS	1	STMicroelectronics	PD84001	
PD84008L	LD MOS	1	STMicroelectronics	PD84008L-E	
R1	300	1	Tyco/Electronics Neohn	CRG Series Thick Film Chip	603
R2	3 K	1	Tyco/Electronics Neohn	CRG Series Thick Film Chip	603
R3, R6	16	2	Tyco/Electronics Neohn	CRG Series Thick Film Chip	603
R4	3.6 K	1	Tyco/Electronics Neohn	CRG Series Thick Film Chip	603
R5	8.2 K	1	Tyco/Electronics Neohn	CRG Series Thick Film Chip	603

Table 4. Parts list (continued)

Designator	Value	Quantity	Manufacturer	Part code	Size
R7	110hm	1	Tyco/Electronics Neohn	CRG Series Thick Film Chip	603
RF In, RF Out, RF Out PA	SMA	3	Johnson		SMA
SUB		1		FR-4	H = 20mil h = 1 oz

4 Circuit layout

Figure 7. Test fixture component layout



5 Circuit schematics

Figure 8. Circuit schematic

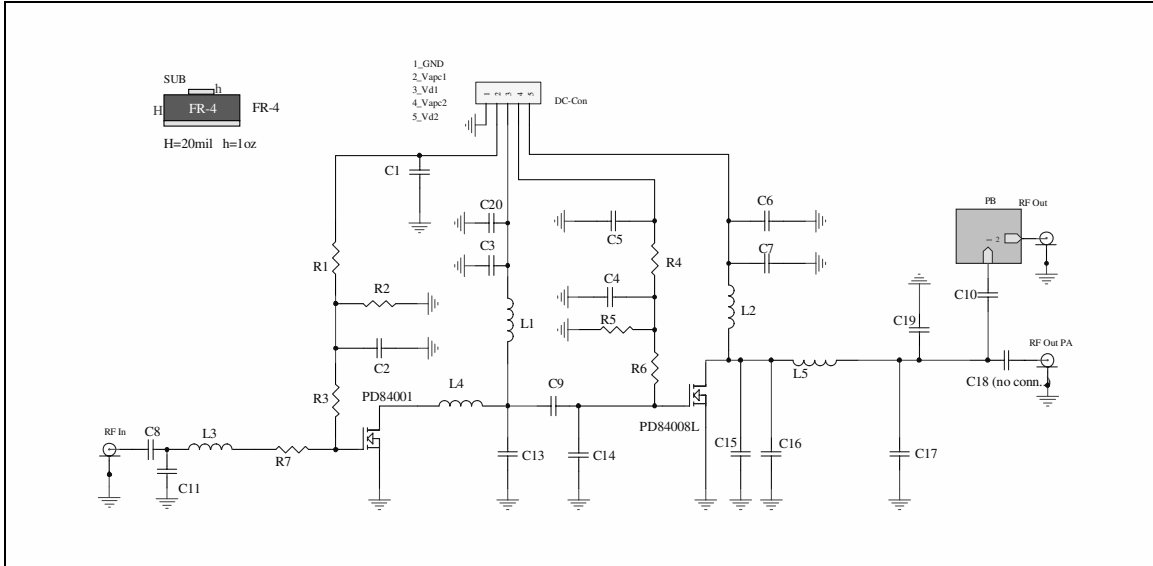
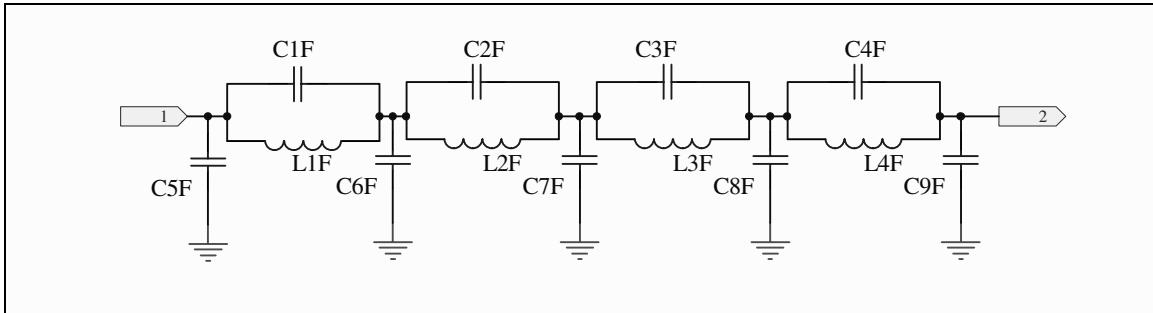


Figure 9. Filter schematic



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. 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

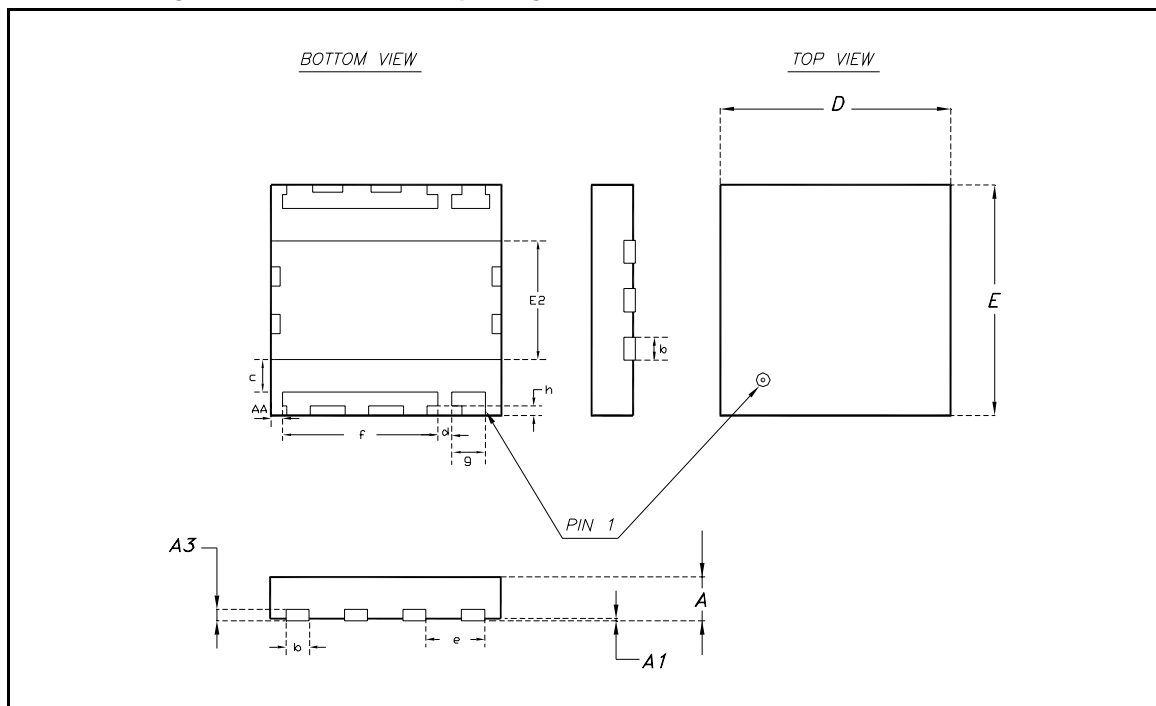
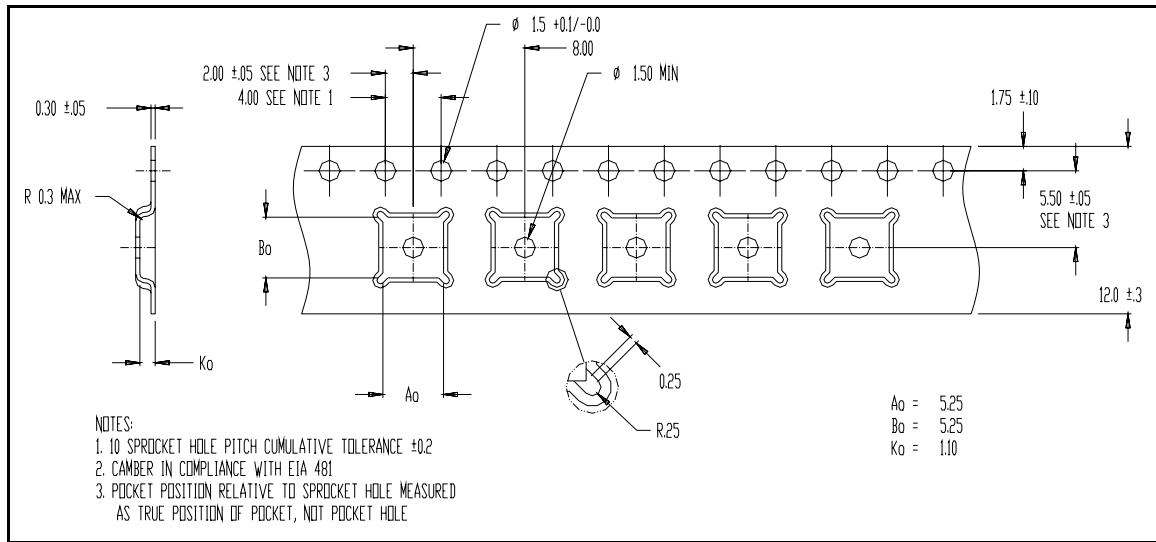


Table 6. PowerFLAT™ tape and reel dimensions

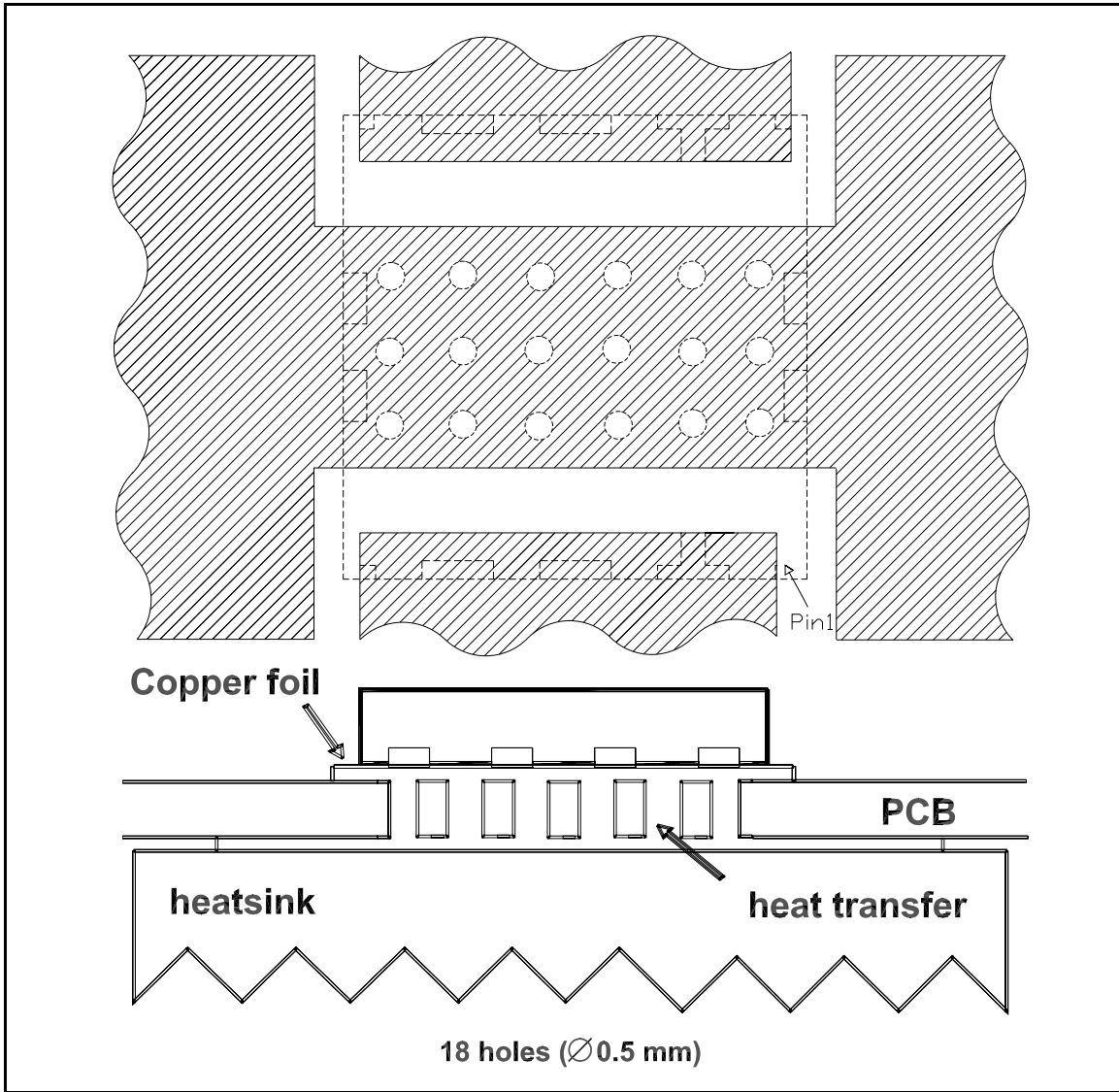
Dim.	mm.			inch		
	Min.	Typ	Max.	Min.	Typ	Max.
Ao	5.15	5.25	5.35	0.12	0.13	0.13
Bo	5.15	5.25	5.35	0.12	0.13	0.13
Ko	1.0	1.1	1.2	0.02	0.02	0.02

Figure 11. PowerFLAT™ tape and reel



6.1.1 Mounting indications

Figure 12. Standard SMD mounting

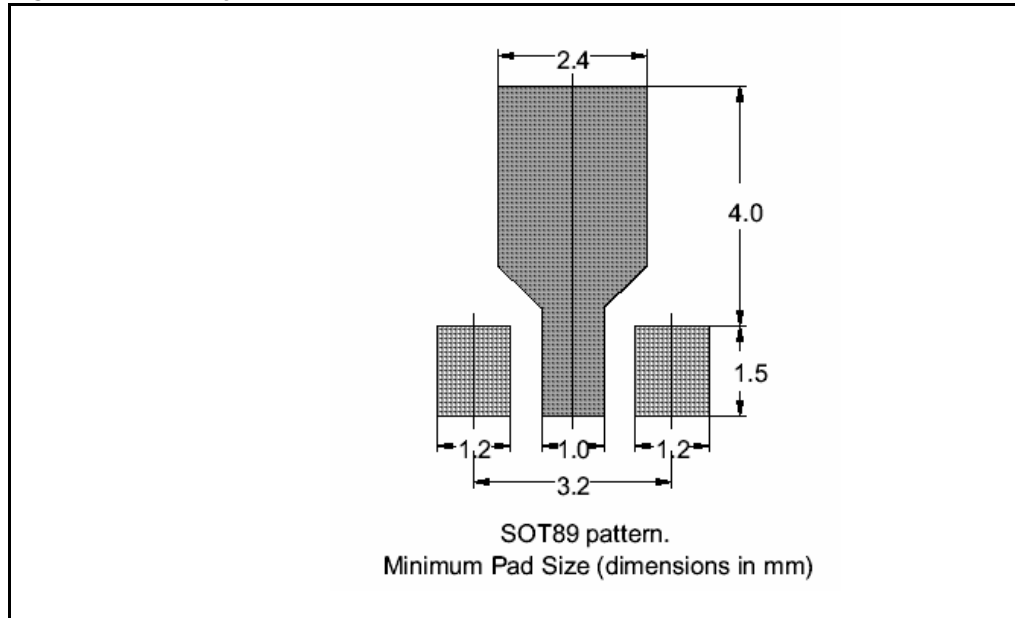


6.2 Thermal pad and via design SOT-89

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

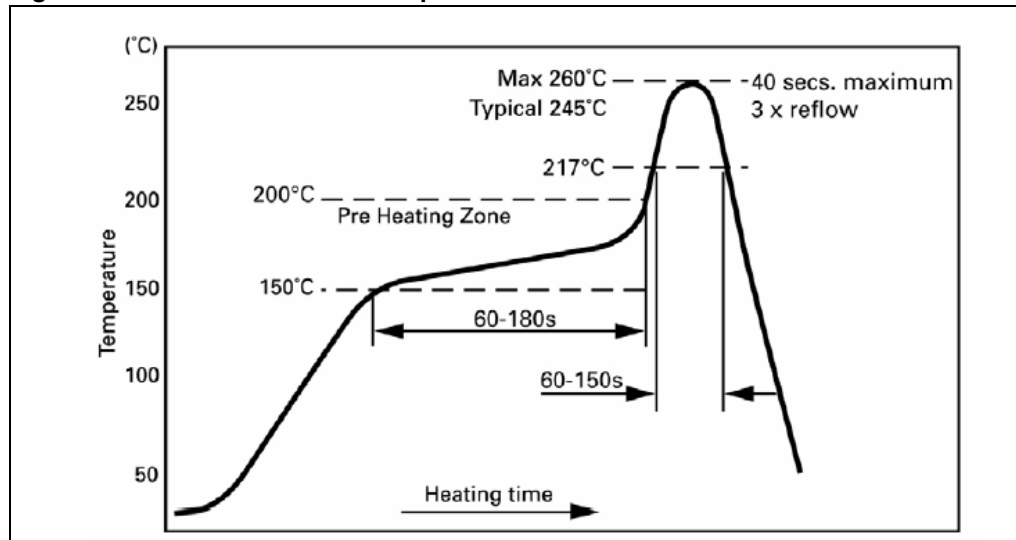


Figure 15 shows the recommended solder for devices with Pb-free terminal plating used with leaded solder, or for devices with leaded terminal plating used with a leaded solder.

Figure 15. Recommended solder profile for leaded devices

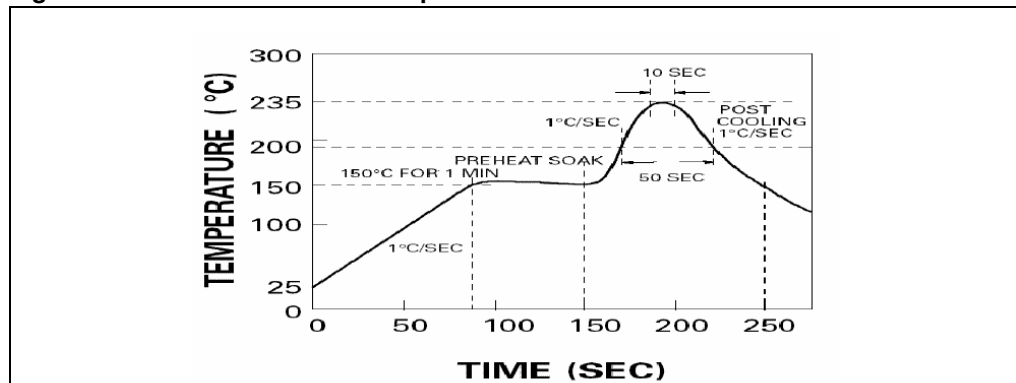
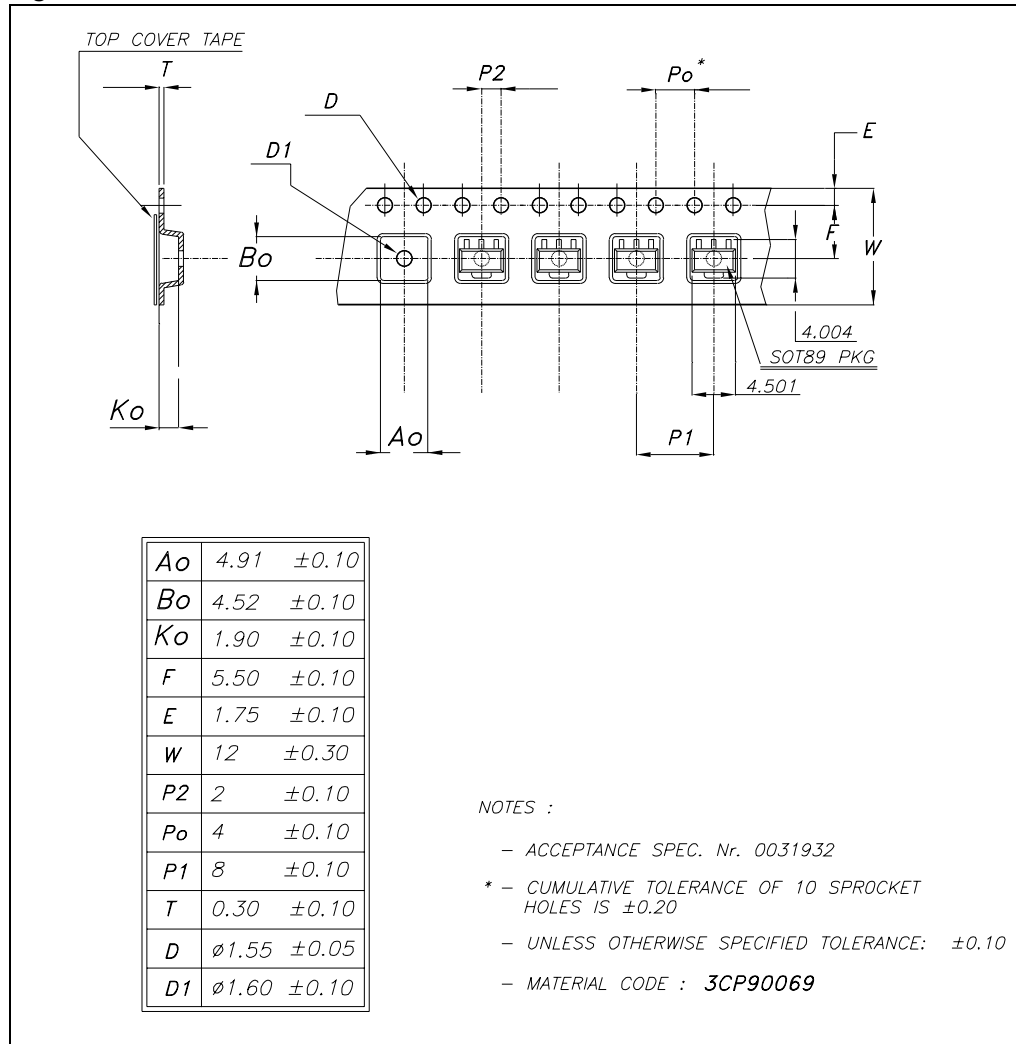


Figure 16. Reel information



7 Revision history

Table 7. Document revision history

Date	Revision	Changes
23-Apr-2009	1	Initial release.

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