

## RF power transistor, LDmoST plastic family

### Features

- Excellent thermal stability
- Common source configuration
- Broadband performances:  
 $P_{OUT} = 6\text{ W}$  with 13 dB gain @ 870 MHz
- Plastic package
- ESD protection
- Supplied in tape and reel
- In compliance with the 2002/95/EC european directive

### Description

The PD84006L-E is a common source N-channel, enhancement-mode lateral Field-Effect RF power transistor. It is designed for high gain, broad band commercial and industrial applications. It operates at 7 V in common source mode at frequencies up to 1 GHz.

PD84006L-E's superior gain and efficiency makes it an ideal solution for portable radio and UHF RFID reader.

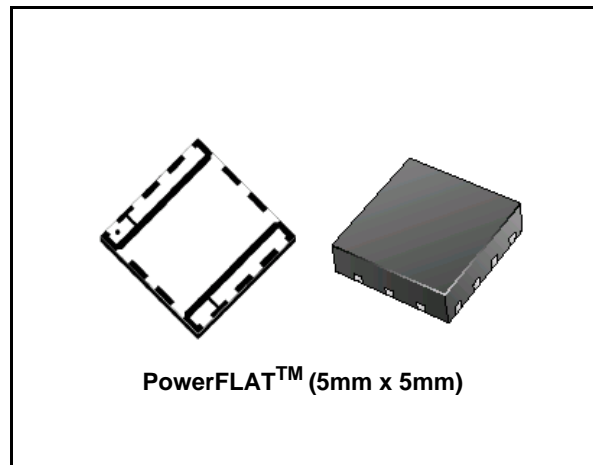


Figure 1. Pin connection

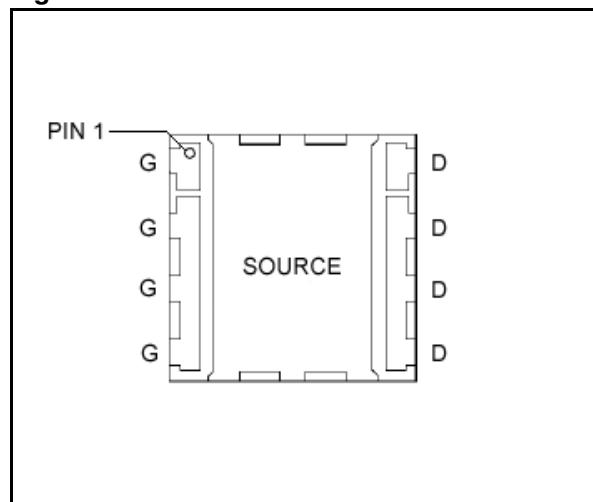


Table 1. Device summary

Order code	Marking	Package	Packaging
PD84006L-E	84006	PowerFLAT™ (5mm x 5mm)	Tape and reel

# Contents

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# 1 Electrical data

## 1.1 Maximum ratings

Table 2. Absolute maximum ratings ( $T_{CASE} = 25^{\circ}C$ )

Symbol	Parameter	Value	Unit
$V_{(BR)DSS}$	Drain-source voltage	25	V
$V_{GS}$	Gate-source voltage	-0.5 to +15	V
$I_D$	Drain current	5	A
$P_{DISS}$	Power dissipation	31	W
$T_J$	Max. operating junction temperature	150	$^{\circ}C$
$T_{STG}$	Storage temperature	-65 to +150	$^{\circ}C$

## 1.2 Thermal data

Table 3. Thermal data

Symbol	Parameter	Value	Unit
$R_{thJC}$	Junction - case thermal resistance	4	$^{\circ}C/W$

## 2 Electrical characteristics

$$T_{CASE} = +25\text{ }^{\circ}\text{C}$$

### 2.1 Static

Table 4. Static

Symbol	Test conditions			Min	Typ	Max	Unit
$I_{DSS}$	$V_{GS} = 0\text{ V}$	$V_{DS} = 25\text{ V}$				1	$\mu\text{A}$
$I_{GSS}$	$V_{GS} = 5\text{ V}$	$V_{DS} = 0\text{ V}$				1	$\mu\text{A}$
$V_{GS(Q)}$	$V_{DS} = 10\text{ V}$	$I_D = 150\text{ mA}$			3.4		V
$V_{DS(ON)}$	$V_{GS} = 10\text{ V}$	$I_D = 1\text{ A}$			0.34		V
$C_{ISS}$	$V_{GS} = 0\text{ V}$	$V_{DS} = 7\text{ V}$	$f = 1\text{ MHz}$		40		pF
$C_{OSS}$	$V_{GS} = 0\text{ V}$	$V_{DS} = 7\text{ V}$	$f = 1\text{ MHz}$		33		pF
$C_{RSS}$	$V_{GS} = 0\text{ V}$	$V_{DS} = 7\text{ V}$	$f = 1\text{ MHz}$		1.45		pF

### 2.2 Dynamic

Table 5. Dynamic

Symbol	Test conditions			Min	Typ	Max	Unit
$P_{3dB}$	$V_{DD} = 7.5\text{ V}, I_{DQ} = 150\text{ mA}, f = 870\text{ MHz}$			5	6		w
GPS	$V_{DD} = 7.5\text{ V}, I_{DQ} = 150\text{ mA}, P_{OUT} = 2\text{ W}, f = 870\text{ MHz}$			15			dB
nD	$V_{DD} = 7.5\text{ V}, I_{DQ} = 150\text{ mA}, P_{OUT} = P_{3dB}, f = 870\text{ MHz}$			50	60		%
Load mismatch	$V_{DD} = 9.5\text{ V}, I_{DQ} = 150\text{ mA}, P_{OUT} = 8\text{ W}, f = 870\text{ MHz}$ All phase angles			20:1			VSWR

### 2.3 ESD protection characteristics

Table 6. ESD protection characteristics

Test conditions		Class
Human body model		2
Machine model		M3

### 2.4 Moisture sensitivity level

Table 7. Moisture sensitivity level

Test methodology	Rating
J-STD-020B	MSL 3

### 3 Impedance

Figure 2. Current conventions

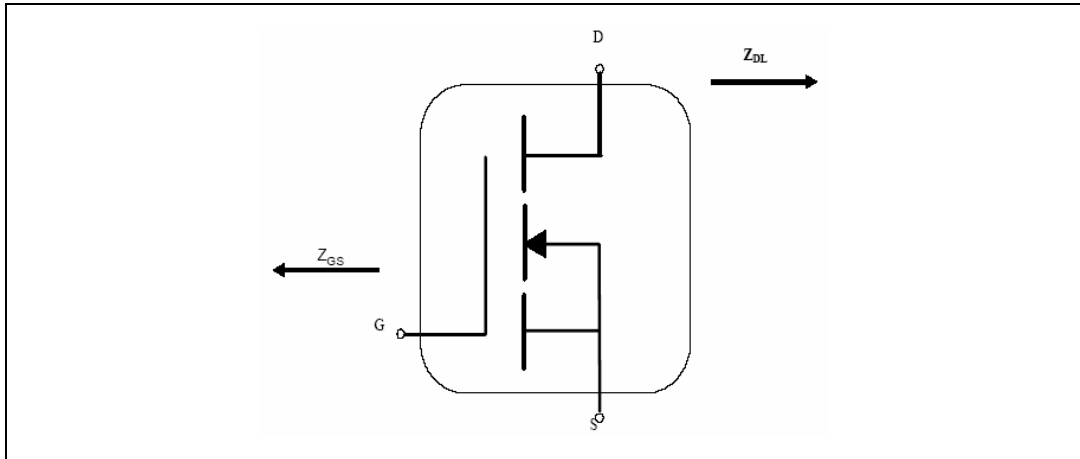
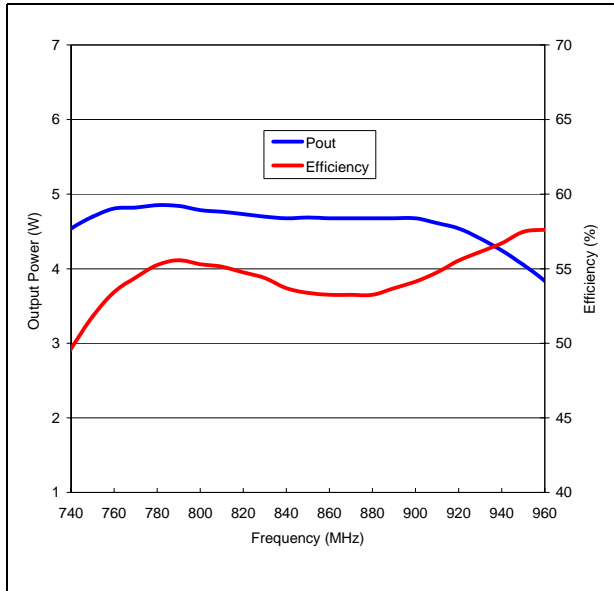


Table 8. Impedance data

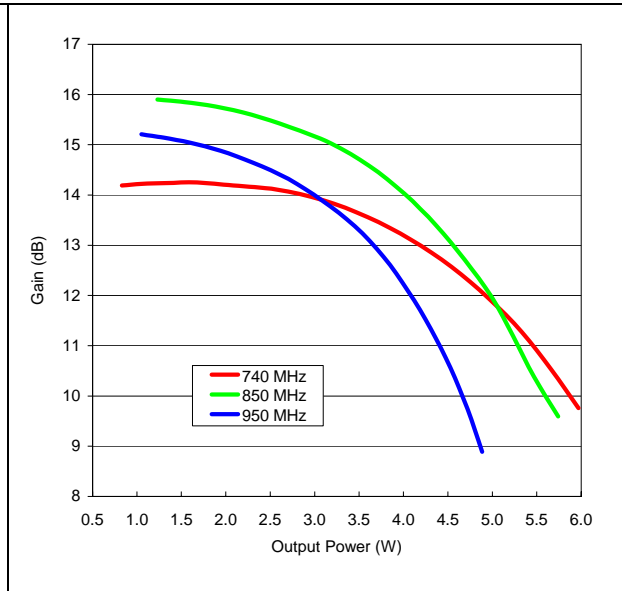
Freq. (MHz)	Z <sub>IN</sub> (Ω)	Z <sub>DL</sub> (Ω)
740	2,52 + j1,42	3,06 + j0,41
750	2,52 + j1,56	3,09 + j0,51
760	2,51 + j1,73	3,12 + j0,64
770	2,46 + j1,84	3,13 + j0,72
780	2,47 + j1,96	3,13 + j0,81
790	2,48 + j2,07	3,13 + j0,87
800	2,45 + j2,22	3,14 + j0,96
810	2,44 + j2,27	3,08 + j1,02
820	2,45 + 2,43	3,05 + j1,04
830	2,41 + j2,57	3,04 + j1,11
840	2,40 + j2,67	2,98 + j1,14
850	2,41 + j2,80	2,99 + j1,24
860	2,38 + j2,92	2,91 + j1,29
870	2,37 + j3,06	2,88 + j1,38
880	2,36 + j3,20	2,81 + j1,40
890	2,37 + j3,25	2,70 + j1,47
900	2,31 + j3,36	2,56 + j1,53
910	2,25 + j3,49	2,50 + j1,62
920	2,16 + j3,57	2,31 + j1,72
930	2,16 + j3,66	2,21 + j1,82
940	2,11 + j3,78	2,11 + j1,96
950	2,06 + j3,86	1,98 + j2,07

# 4 Typical performance

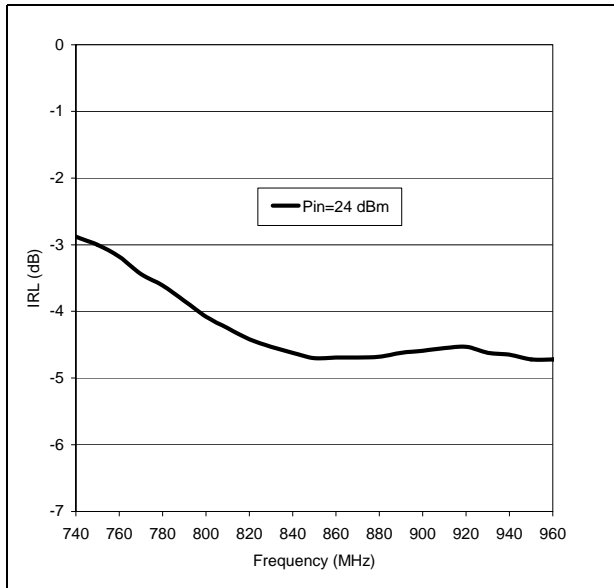
**Figure 3. Output power and efficiency vs frequency** Vdd = 7.2 V, Idq = 200 mA  
Pin = 24 dBm



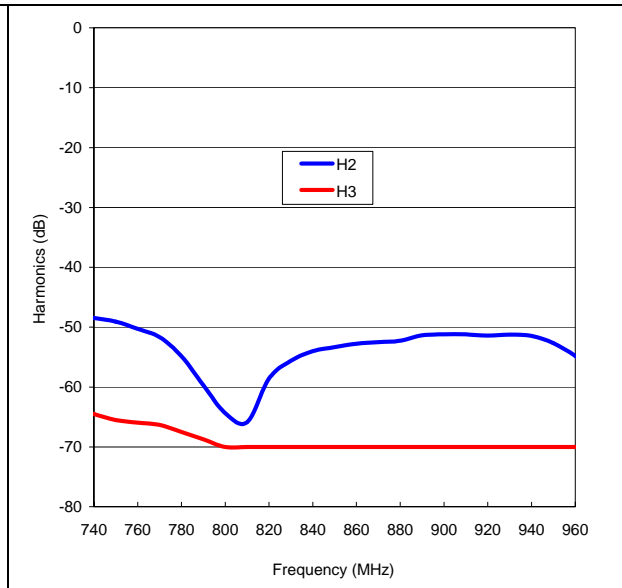
**Figure 4. Gain vs output power** Vdd = 7.2 V, Idq = 200 mA



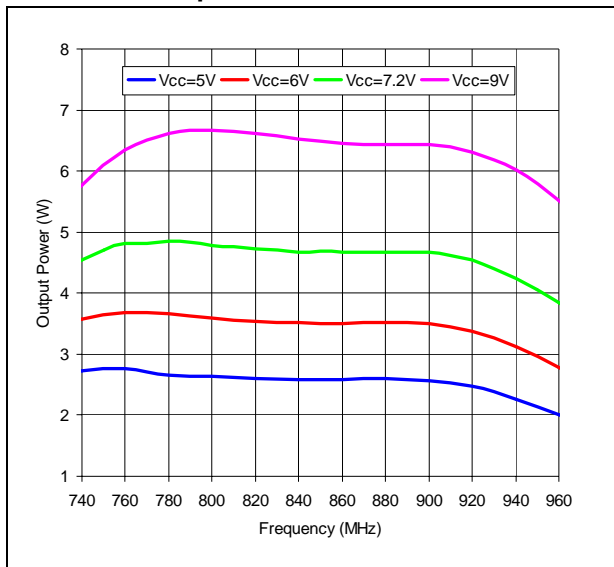
**Figure 5. Input return loss vs frequency** Vdd = 7.2 V, Idq = 200 mA



**Figure 6. Harmonics vs frequency** Vdd=7.2 V, Idq = 200 mA, Pin = 24 dBm



**Figure 7. Output power vs frequency and supply voltage  $P_{in} = 24\text{ dBm}$ ,  $I_{dq} = 200\text{ mA}$**



## 5 Test circuit

Figure 8. Test circuit schematic

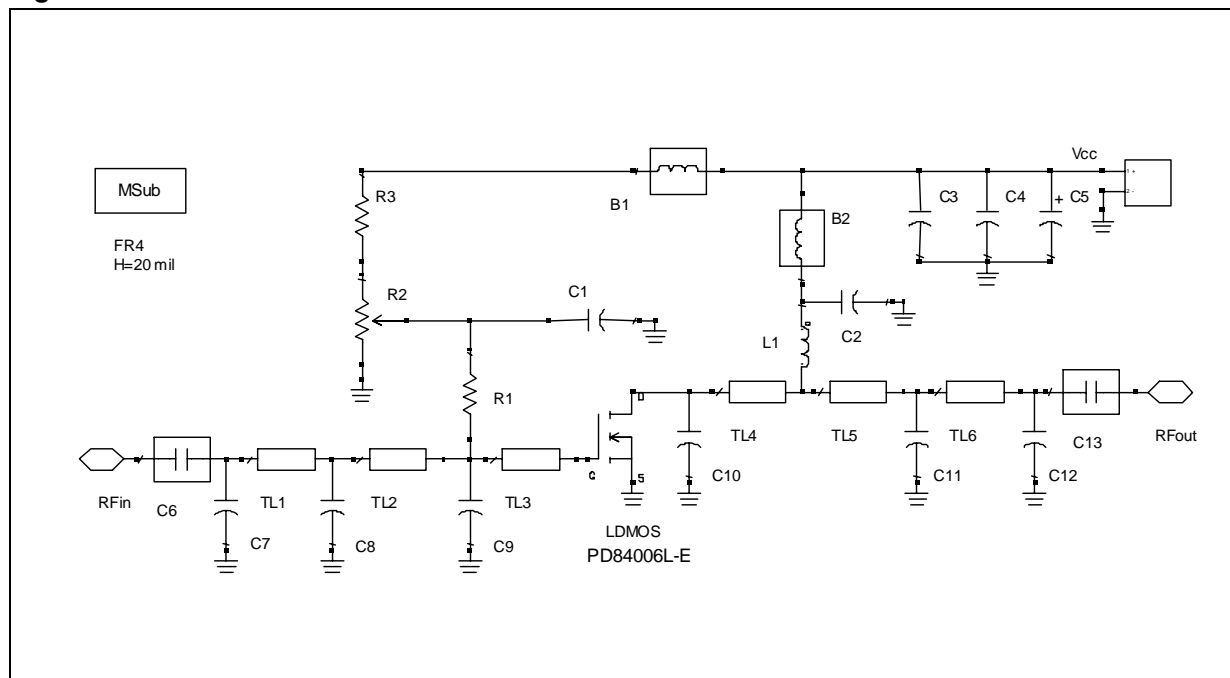


Table 9. Part list

Component ID	Description	Value	Case size	Manufacturer	Part code
B1, B2	Ferrite Bead			Panasonic	EXCELDRC35C
C1, C2	Capacitor	150 pF	0603	Murata	GRM39-C0G151J50D500
C3	Capacitor	1 nF	0603	Murata	GRM39-COG102J50D500
C4	Capacitor	10 nF	0603	Murata	GRM39-X7R103K50C560_
C5	Capacitor	10 uF	SMT	Panasonic	EEVHB1V100P
C6, C13	Capacitor	39 pF	0603	Murata	GRM39-C0G390J50D500
C7	Capacitor	3,3 pF	0603	Murata	GQM1885C2A3R3C
C8	Capacitor	8,2 pF	0603	Murata	GQM1885C1H8R2D
C9	Capacitor	18 pF	0603	Murata	GQM1885C1H180J
C10	Capacitor	15 pF	0603	Murata	GQM1885C1H150J
C11	Capacitor	12 pF	0603	Murata	GQM1885C1H120J
C12	Capacitor	4,7 pF	0603	Murata	GQM1885C2A4R7
L1	Inductor	12.55 nH		Coilcraft	1606-10



Table 9. Part list (continued)

Component ID	Description	Value	Case size	Manufacturer	Part code
R1	Resistor	56 $\Omega$	0603	Tyco electronics	
R2	Potentiometer	10 K $\Omega$		Bourns electronics	3214W-1-103E
R3	Resistor	1 K	0603	Tyco electronics	01623440-1
TL1	Transmission line	W=0.92mm	L= 13,50 mm		
TL2	Transmission line	W=0.92mm	L= 3,15 mm		
TL3	Transmission line	W=0.92mm	L= 2,90 mm		
TL4	Transmission line	W=0.92mm	L= 2,00 mm		
TL5	Transmission line	W=0.92mm	L= 2,20 mm		
TL6	Transmission line	W=0.92mm	L= 13,20 mm		
RF in, RF out	SMA-CONN	50 $\Omega$	60 mils	JOHNSON	142-0701-801
PD84006L-E	LDMOS			STMicroelectronics	PD84006L-E
Board	FR-4 THk=0.020" 2OZ Cu both sides				

## 6 Circuit layout and photo

Figure 9. Circuit layout

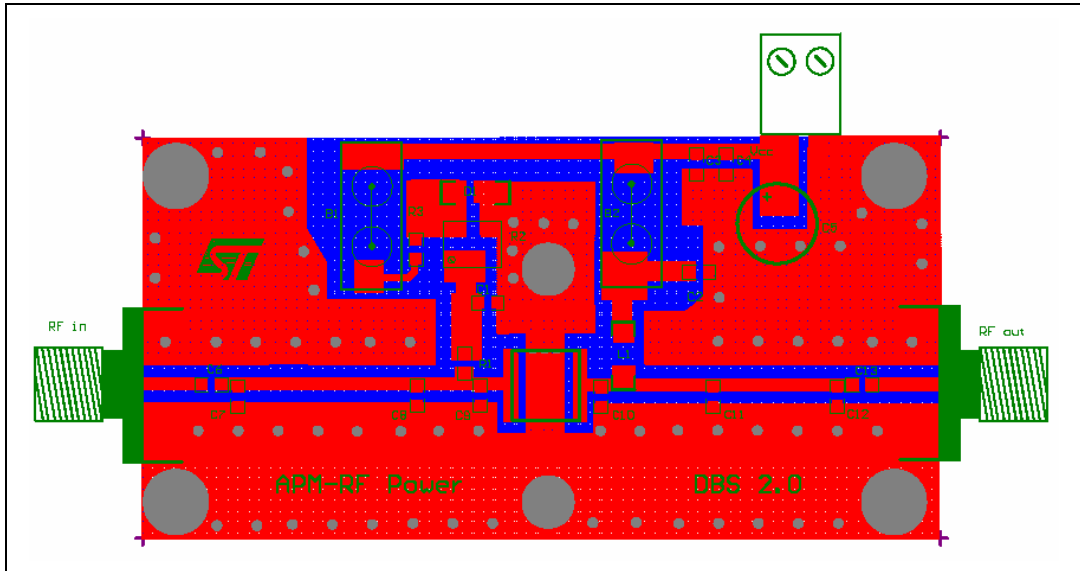
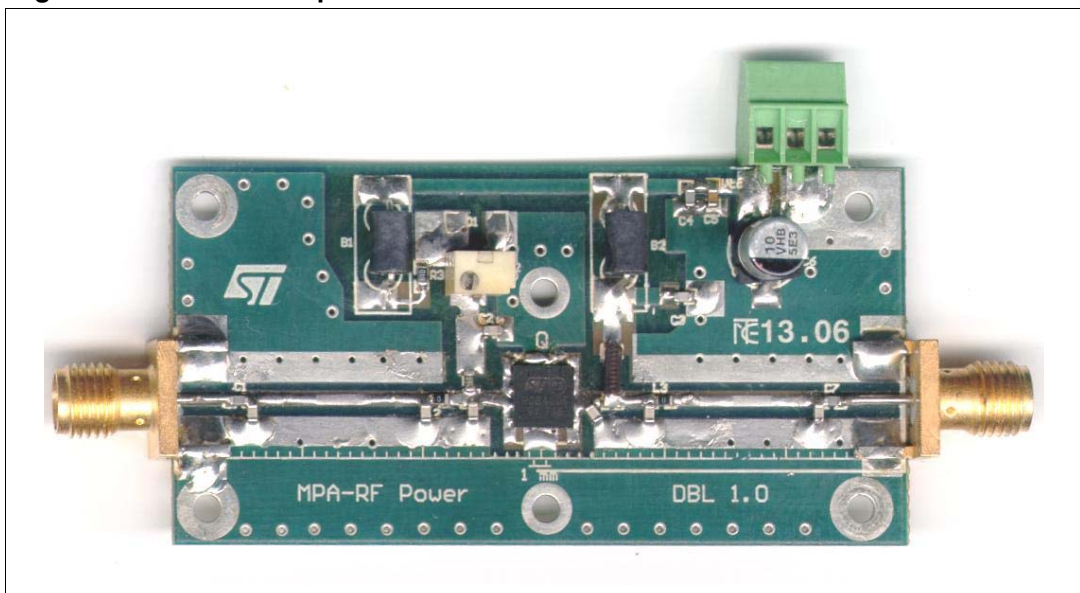


Figure 10. Demoboard photo



## 7 Package mechanical data

In order to meet environmental requirements, ST offers these devices in ECOPACK® packages. These packages have a Lead-free second level interconnect . The category of second level interconnect is marked on the package and on the inner box label, in compliance with JEDEC Standard JESD97. The maximum ratings related to soldering conditions are also marked on the inner box label. ECOPACK is an ST trademark. ECOPACK specifications are available at: [www.st.com](http://www.st.com)

**Table 10. Tape and reel dimensions**

Dim.	Mm		
	Min.	Typ	Max.
Ao	5.15	5.25	5.35
Bo	5.15	5.25	5.35
Ko	1.0	1.1	1.2

**Figure 11. Tape and reel dimensions**

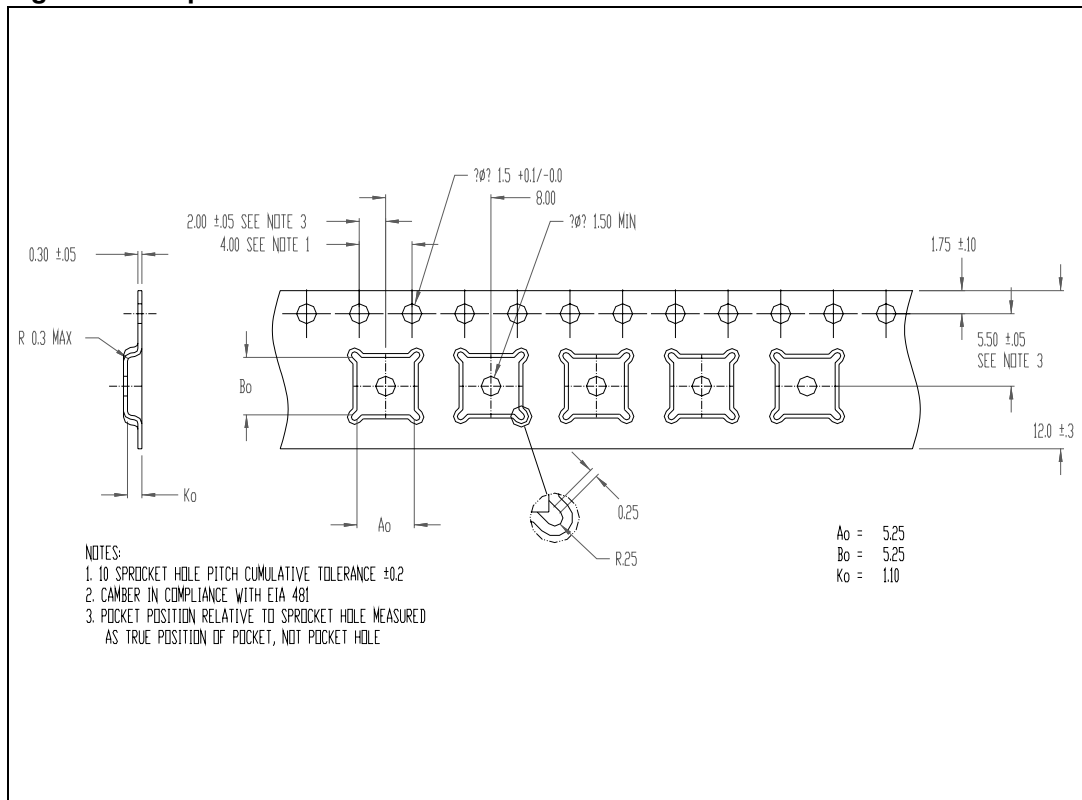


Figure 12. PowerFLAT™ (5x5) recommended footprint

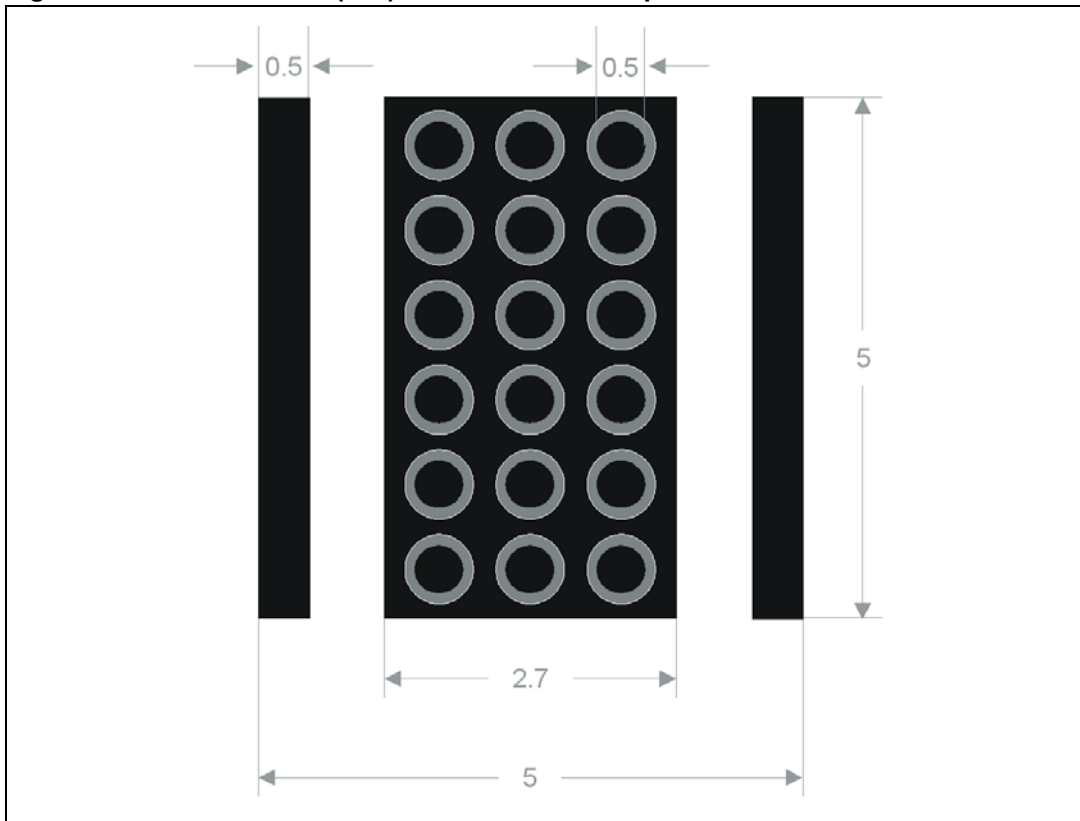
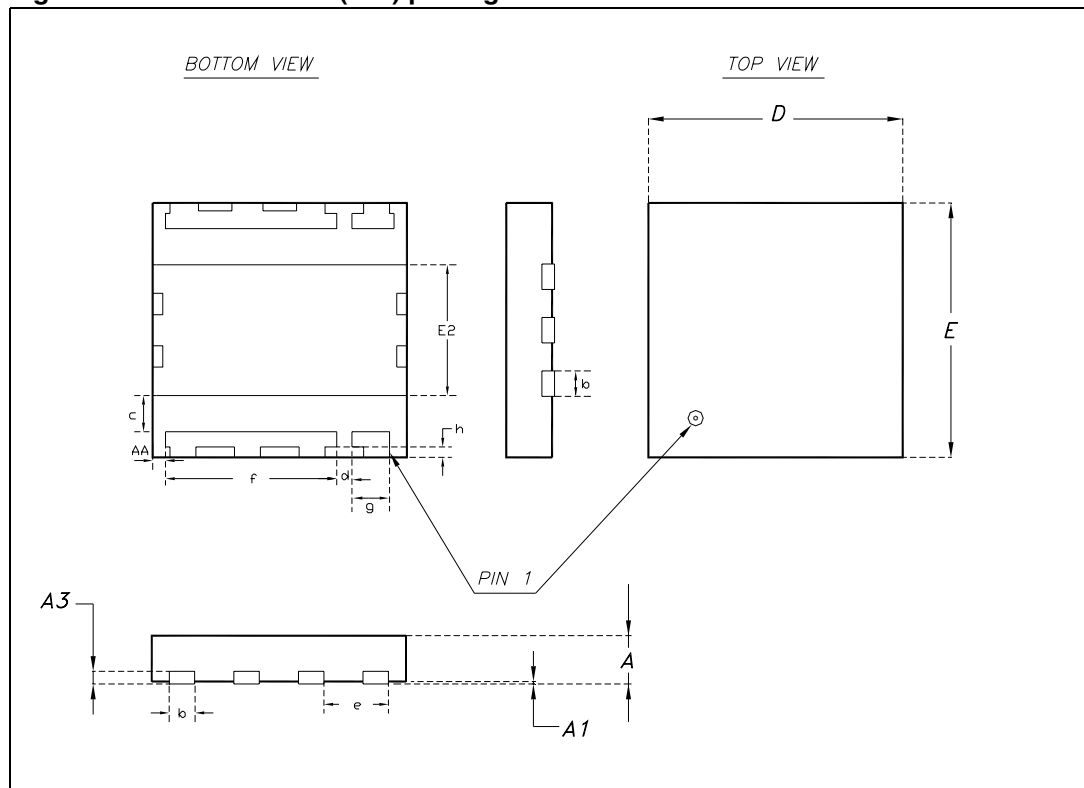


Table 11. PowerFLAT™ (5x5) mechanical data

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 13. PowerFLAT™ (5x5) package dimensions



## 8 Revision history

**Table 12. Document revision history**

Date	Revision	Changes
31-Jul-2007	1	First release
29-Jan-2008	2	Added: <i>Section 3: Impedance on page 5, Section 4: Typical performance on page 6, Section 5: Test circuit on page 8, Section 6: Circuit layout and photo on page 10</i>
15-Jul-2008	3	Marking change from 8406 to 84006 see <i>Table 1</i>

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