



DB-54003L-175A

RF power amplifier using 1 x PD54003L
N-channel enhancement-mode lateral MOSFETs

Feature

- Excellent thermal stability
- Frequency: 155 - 175 MHz
- Supply voltage: 7.5V
- Output power: > 3W
- Power gain 15.1 +/- 0.3 dB
- Efficiency: 65% - 69%
- Load mismatch: 20:1
- BeO free amplifier

Description

The DB-54003L-175A is a common source N-channel enhancement-mode lateral field effect RF power amplifier designed for VHF applications such as car locator and marine portable radio.

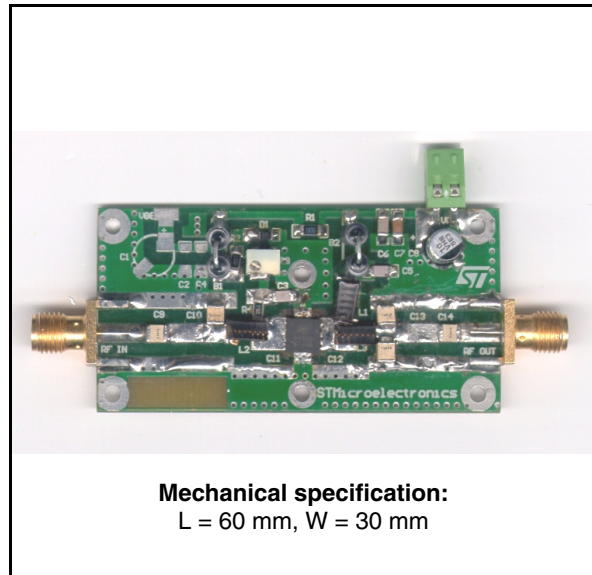


Table 1. Device summary

Order code
DB-54003L-175A

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1 Electrical data

1.1 Maximum ratings

Table 2. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DD}	Supply voltage	16	V
I_D	Drain current	1.3	A
P_{DISS}	Power dissipation	6	W
T_{CASE}	Operating case temperature	-20 to +85	°C
T_A	Max. ambient temperature	+55	°C

2 Electrical characteristics

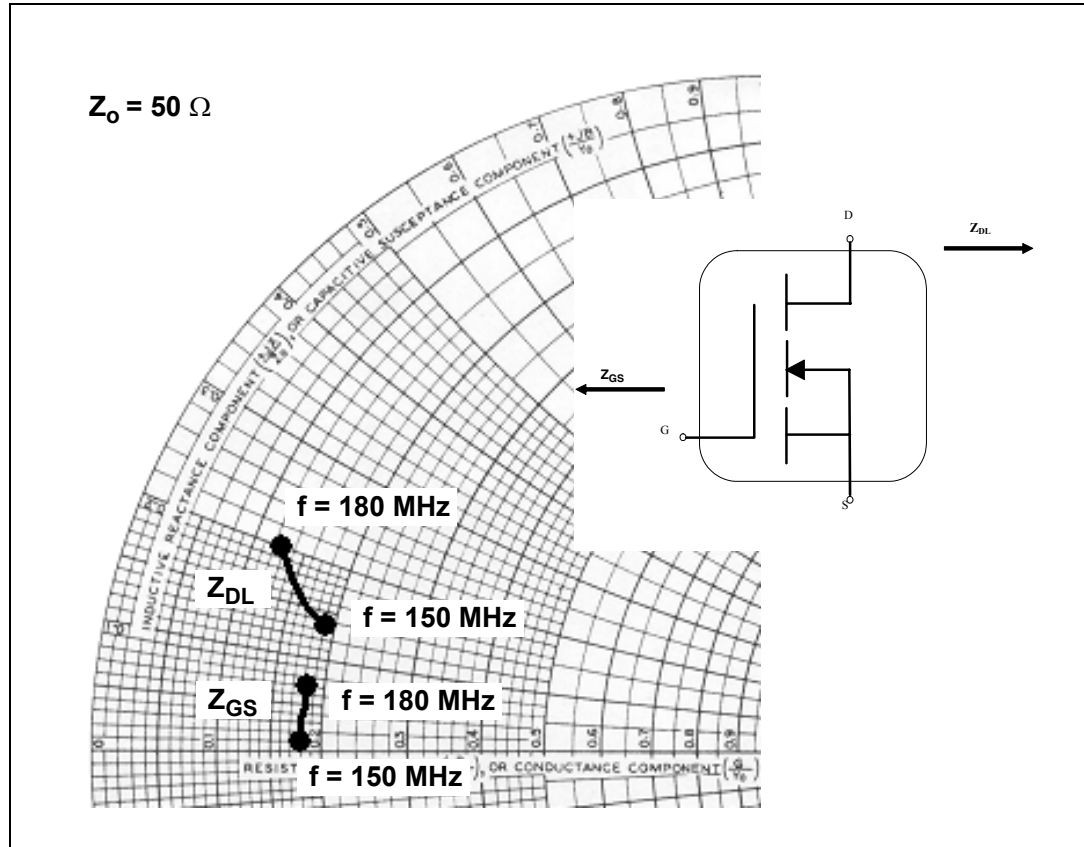
$T_A = +25\text{ °C}$, $V_{DD} = 8\text{V}$, $I_{dq} = 100\text{ mA}$, unless otherwise specified

Table 3. RF data

Symbol	Parameters	Test conditions	Min.	Typ.	Max.	Unit
f	Frequency range		155		175	MHz
P_{out}	Output Power		3			W
G_p	Power Gain	$P_{OUT} = 3\text{ W}$		15		dB
N_D	Efficiency	$P_{OUT} = 3\text{ W}$	65			%
	Gain Flatness	$P_{OUT} = 3\text{ W}$			+/- 0.3	dB
H2	2nd Harmonic	$P_{OUT} = 3\text{ W}$		-25	-20	dBc
H3	3rd Harmonic	$P_{OUT} = 3\text{ W}$		-35	-30	dBc
VSWR	Load Mismatch	$P_{OUT} = 3\text{ W}$, all phases		20:1		

3 Impedance

Figure 1. Impedance graphic



Note: Optimum board impedances for which the DUT operates, at given DC bias and frequency band, to meet application requirements.

Table 4. Impedance data

f(MHz)	$Z_{GS} (\Omega)$	$Z_{DL} (\Omega)$
150	$8.7 + j 0.7$	$9.3 + j 6.9$
160	$8.7 + j 1.7$	$7.9 + j 7.7$
170	$8.8 + j 2.6$	$6.9 + j 8.8$
180	$8.9 + j 3.6$	$6.0 + j 10.1$

4 Typical performance

Figure 2. Output power vs input power

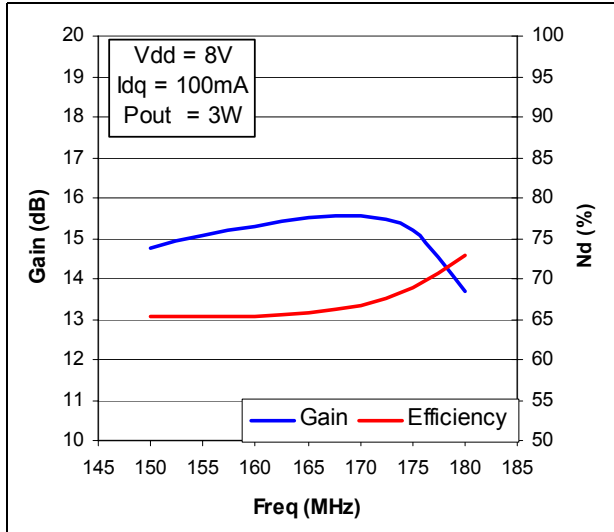


Figure 3. Efficiency vs output power

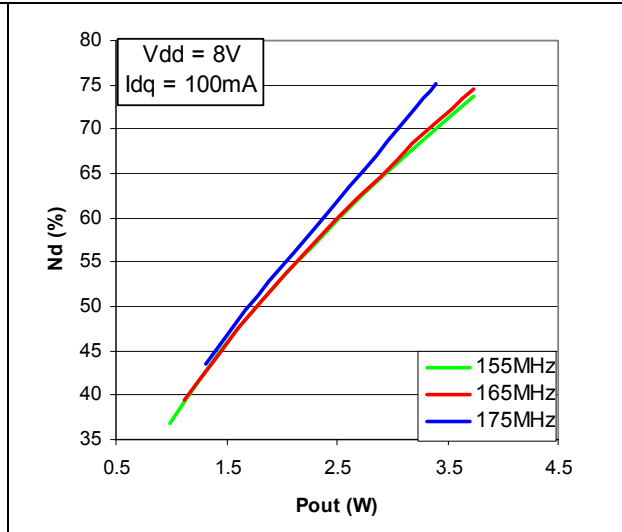


Figure 4. Power gain and efficiency vs output power

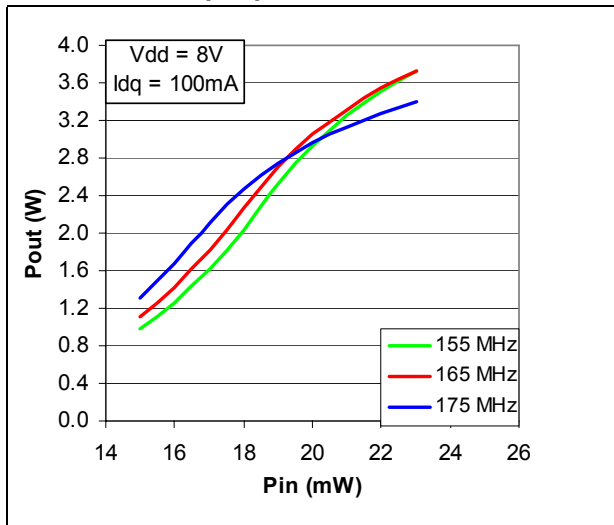


Figure 5. Input return loss vs frequency

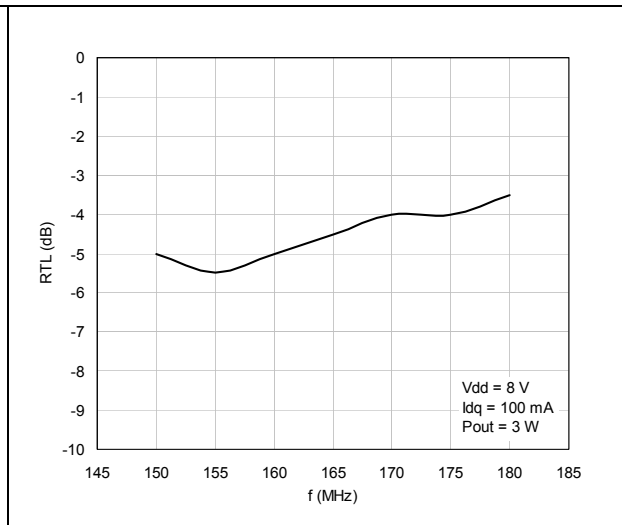


Figure 6. Harmonics vs frequency

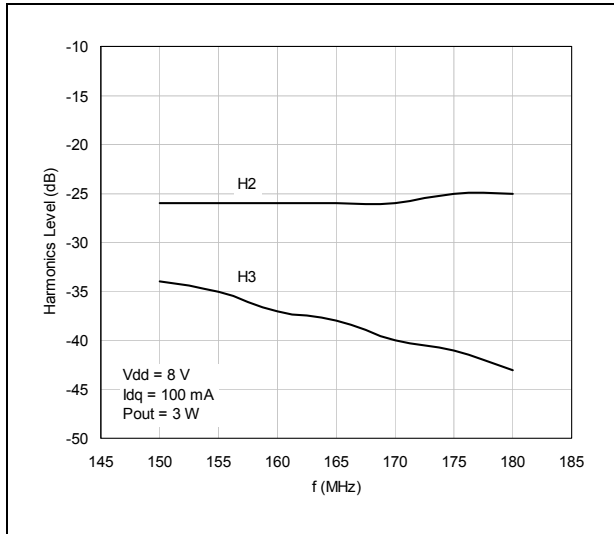
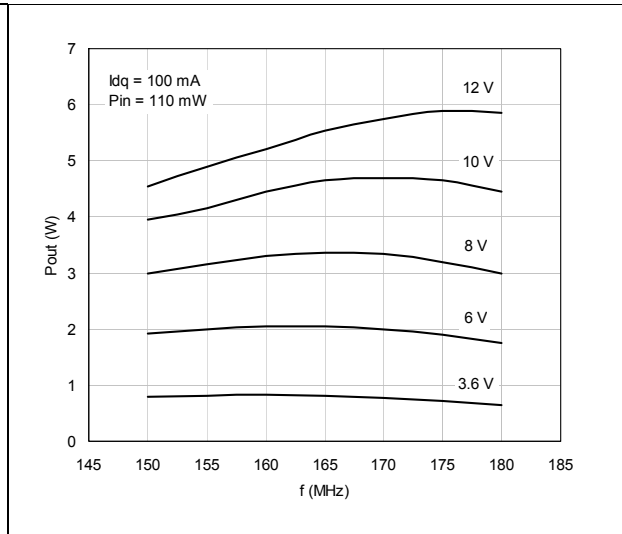


Figure 7. Output power vs freq and drain volt



5 Test circuit

Table 5. Test circuit schematic

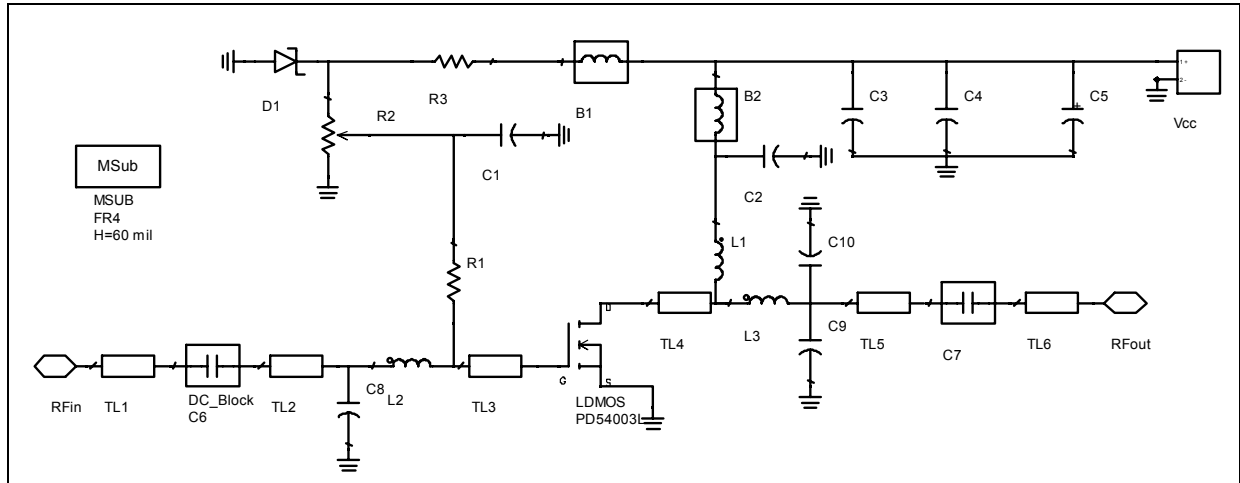


Table 6. Components part list for DB-54003L-175A

Component ID	Description	Value	Case size	Manufacturer	Part code
B1	Ferrite bead			Panasonic	EXCELDR35C
B2	Ferrite bead			Panasonic	EXCELDR35C
C1, C2	Capacitor	120 pF	1206	Murata	GRM42-6C0G121J50
C3	Capacitor	1 nF	1206	Murata	GRM42-6C0G102J50
C4	Capacitor	10 nF	1206	Murata	GRM42-6X7R104K50
C5	Capacitor	10 uF	SMT	Panasonic	EEVHB1V100P
D1	Zener diode	5.1 V	SOD110	Philips	BZX284C5V1
C6,C7	Capacitor	560 pF	100B	ATC	ATC 100B 561FW
C8, C9	Capacitor	27 pF	100B	ATC	ATC 100B 270JW
C10	Capacitor	12 pF	100B	ATC	ATC 100B 120JW
L1	Inductor	17.5 nH		Coilcraft	B06T
L2	Inductor	28 nH		Coilcraft	B08T
L3	Inductor	22 nH		Coilcraft	B07T
R1	Resistor	15 Ω	1206	Tyco electronics	01623440-1
R2	Potentiometer	10 KΩ		Bourns electronics	3214W-1-103E
R3	Resistor	1 K	1206	Tyco electronics	01623440-1
TL1	Transmission line	50 Ω	8.6 mm		
TL2	Transmission line	50 Ω	9.2 mm		
TL3	Transmission line	25 Ω	5.4 mm		

Table 6. Components part list for DB-54003L-175A (continued)

Component ID	Description	Value	Case size	Manufacturer	Part code
TL4	Transmission line	25 Ω	5.9 mm		
TL5	Transmission line	50 Ω	8.55 mm		
TL6	Transmission line	50 Ω	7.5 mm		
RF in, RF out	SMA-CONN	50 Ω	60 mils	Johnson	142-0701-801
PD54003L	LDMOS			STMicroelectronics	PD54003L
Board	FR-4 THk=0.060" 2OZ Cu both sides				

6 Circuit layout

Figure 8. Test fixture component layout

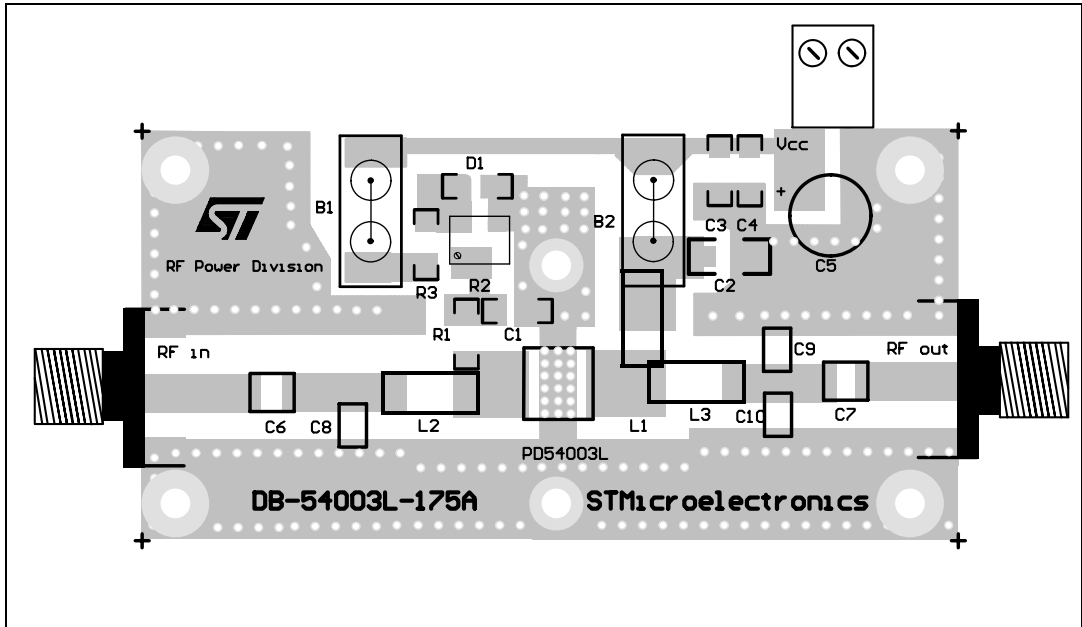
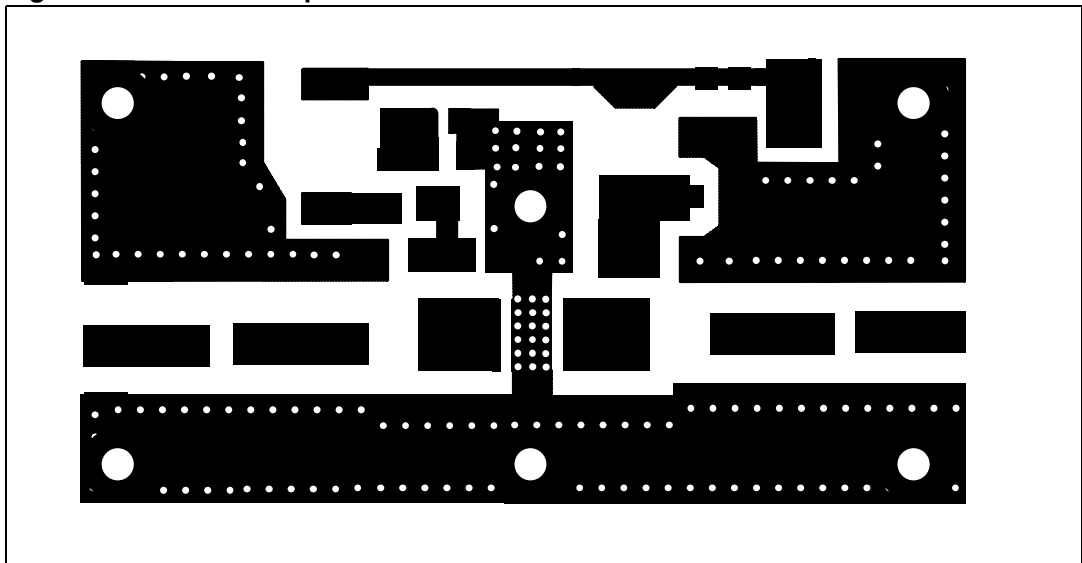
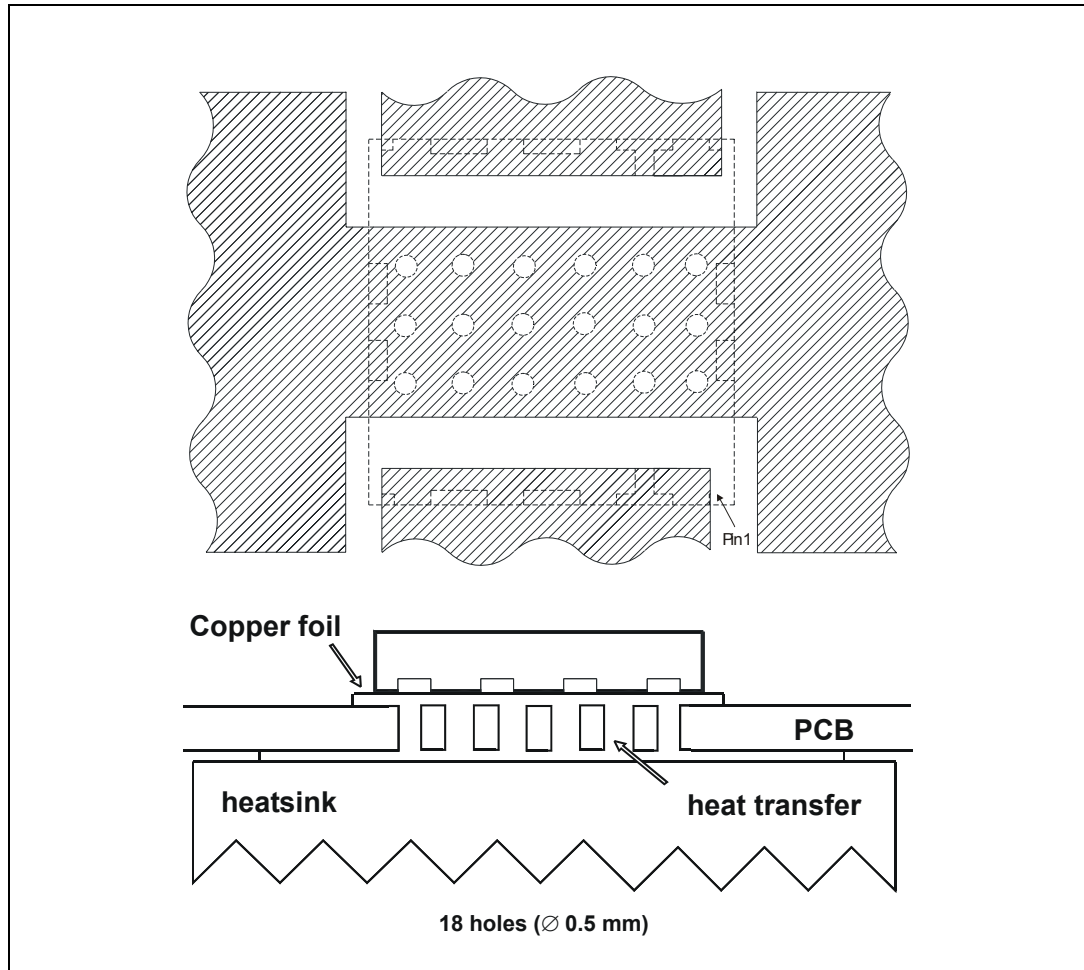


Figure 9. Test circuit photomaster



7 Mounting indications

Figure 10. Standard SMD mounting



8 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

Table 7. 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 11. PowerFLAT™ package dimensions

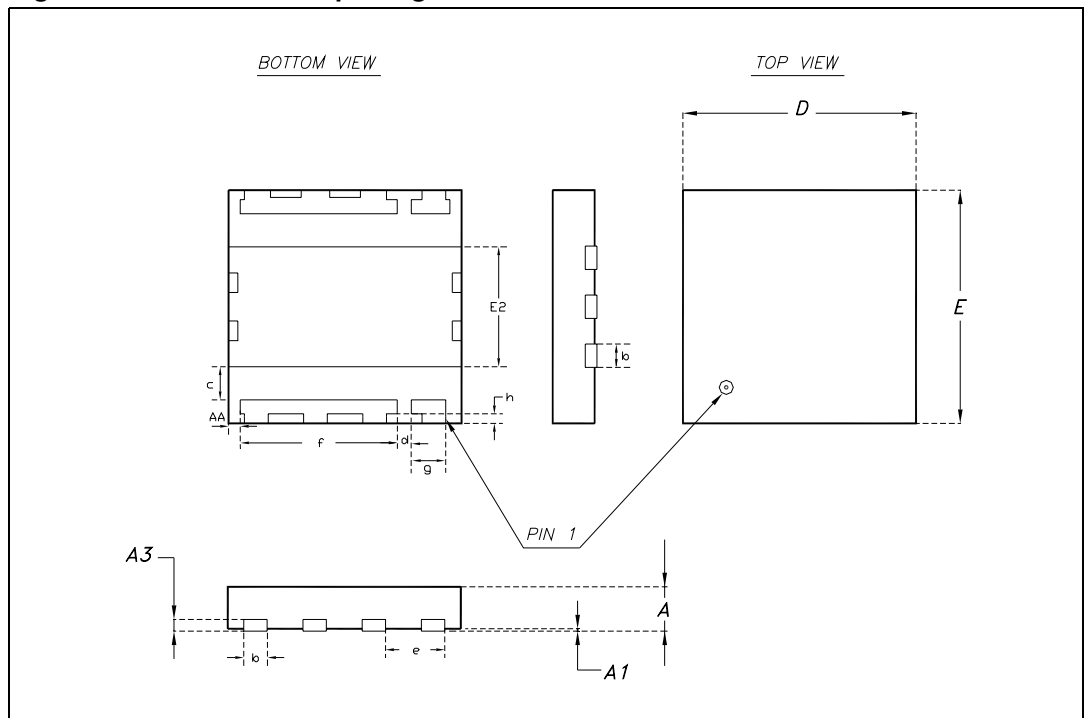
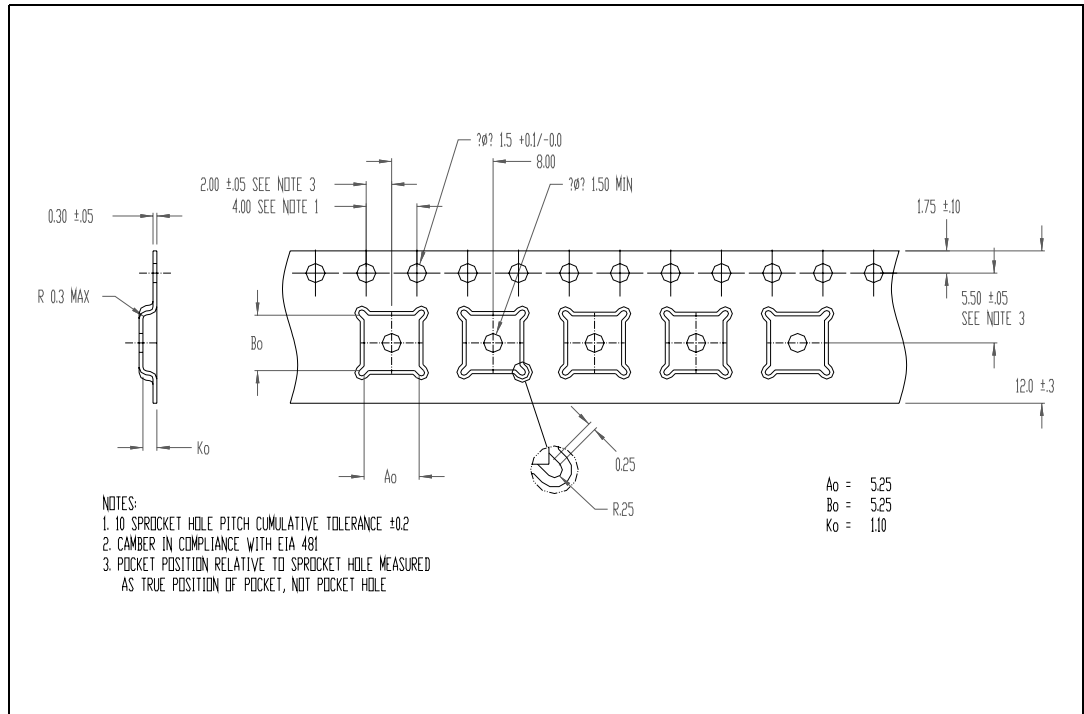


Table 8. PowerFLAT™ tape and reel dimensions

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 12. PowerFLAT™ tape and reel



9 Revision history

Table 9. Document revision history

Date	Revision	Changes
14-Sep-2005	1	First Issue.
19-Jan-2007	2	Updated: Component part list, test circuit schematic and test fixture component layout
17-May-2007	3	Updated Table 6 on page 7 , cover page and figure 4 and 6
11-May-2008	4	Updated photo on cover page

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