

DB-54003-470

RF POWER amplifier using 1 x PD54003
N-Channel enhancement-mode lateral MOSFETs

General feature

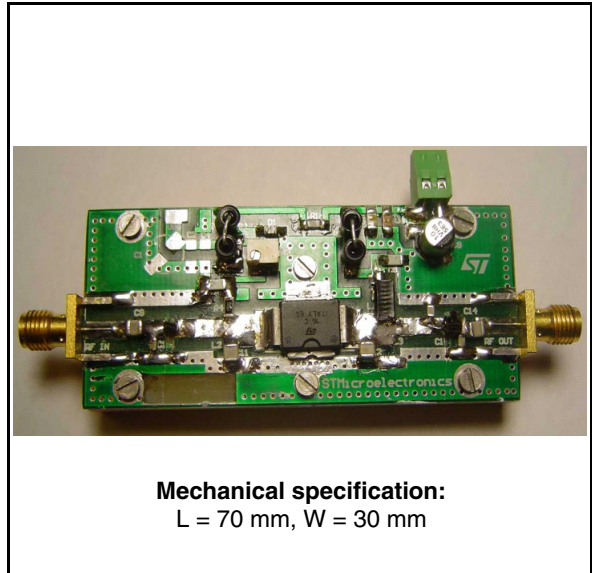
- Excellent thermal stability
- Frequency: 400 - 470MHz
- Supply voltage: 7.5V
- Output power: 3W
- Efficiency: 50% - 53%
- Load mismatch: 20:1
- Beo free amplifier

Description

The DB-54003-470 is a common source N-Channel Enhancement-Mode Lateral Field Effect RF power amplifier designed for UHF Portable radio applications

Order Code

- DB-54003-470



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1 Electrical data

1.1 Maximum ratings

Table 1. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DD}	Supply voltage	16	V
I_D	Drain current	2	A
T_{CASE}	Operating case temperature	-20 to +85	°C
T_A	Max. ambient temperature	+55	°C

2 Electrical characteristics

$T_A = +25\text{ }^\circ\text{C}$, $V_{DD} = 7.5\text{V}$, $I_{DQ} = 100\text{ mA}$

Table 2. Electrical Specification

Symbol	Test Conditions	Min	Typ	Max	Unit
Freq	Frequency range	400		470	MHz
P_{OUT}		3	4		W
Gain	@ $P_{OUT} = 3\text{W}$	12.1 \pm 0.3dB			dB
ND	@ $P_{OUT} = 3\text{W}$	50		53	%
H2	2 ND Harmonic @ $P_{OUT} = 3\text{W}$		-53	-50	dBc
H3	3 RD Harmonic @ $P_{OUT} = 3\text{W}$		-60	-55	dBc
VSWR	Load mismatch all phases @ $P_{OUT} = 3\text{W}$			20:1	

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3 Typical performance

Figure 1. Output power vs input power Figure 2. Gain vs output power

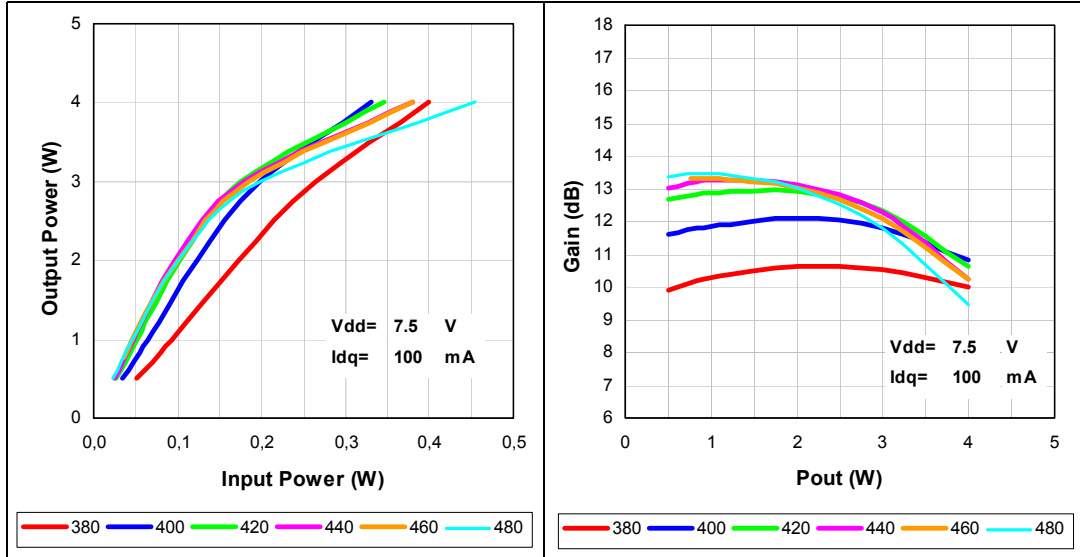


Figure 3. Drain efficiency vs output power

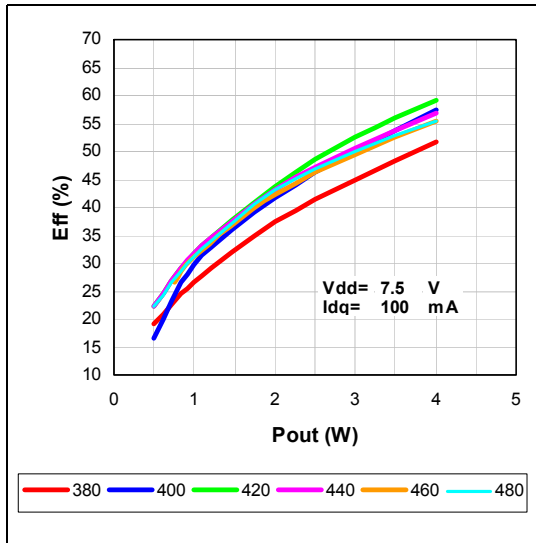
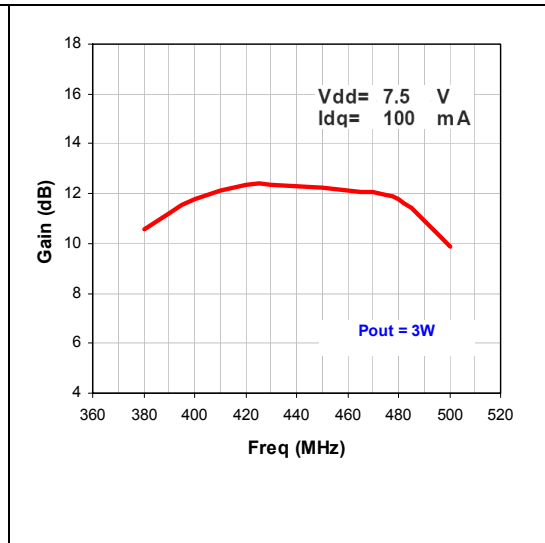


Figure 4. Gain vs frequency



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Figure 5. Efficiency vs frequency

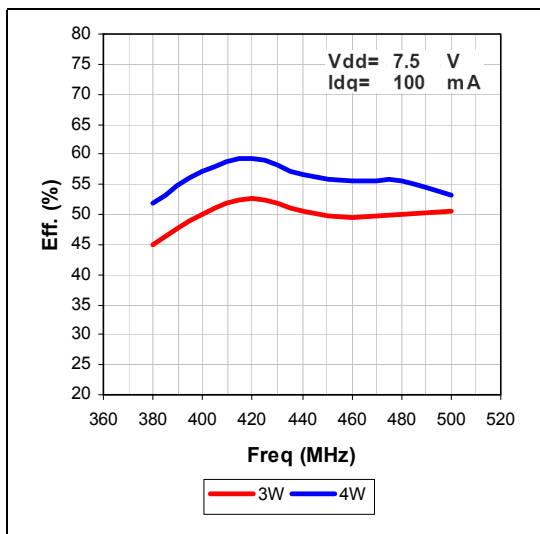
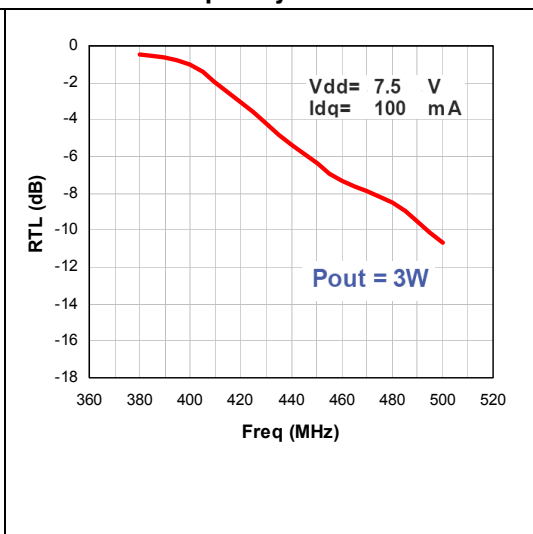


Figure 6. Input return loss vs frequency



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Figure 7. Harmonics vs frequency

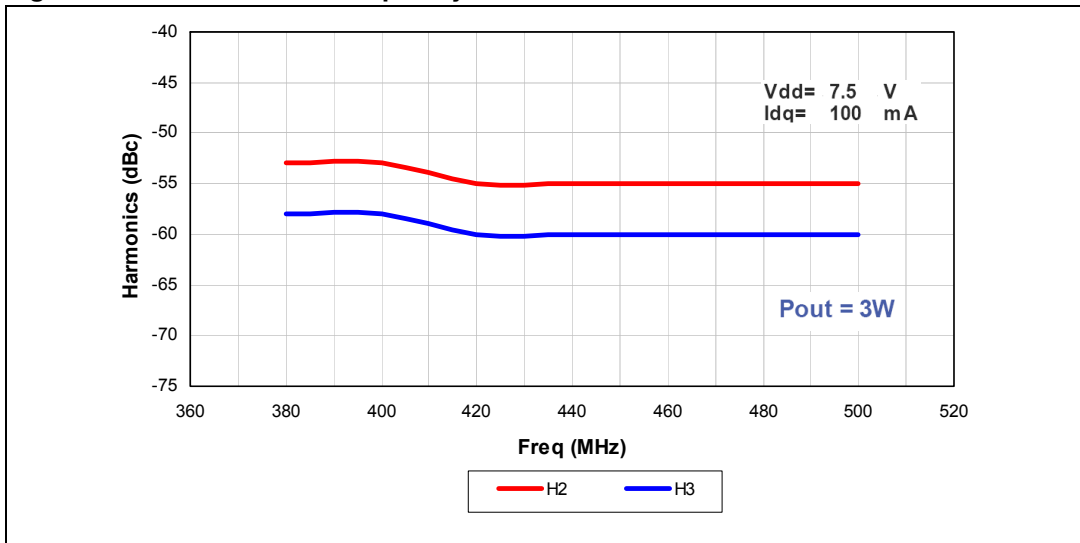
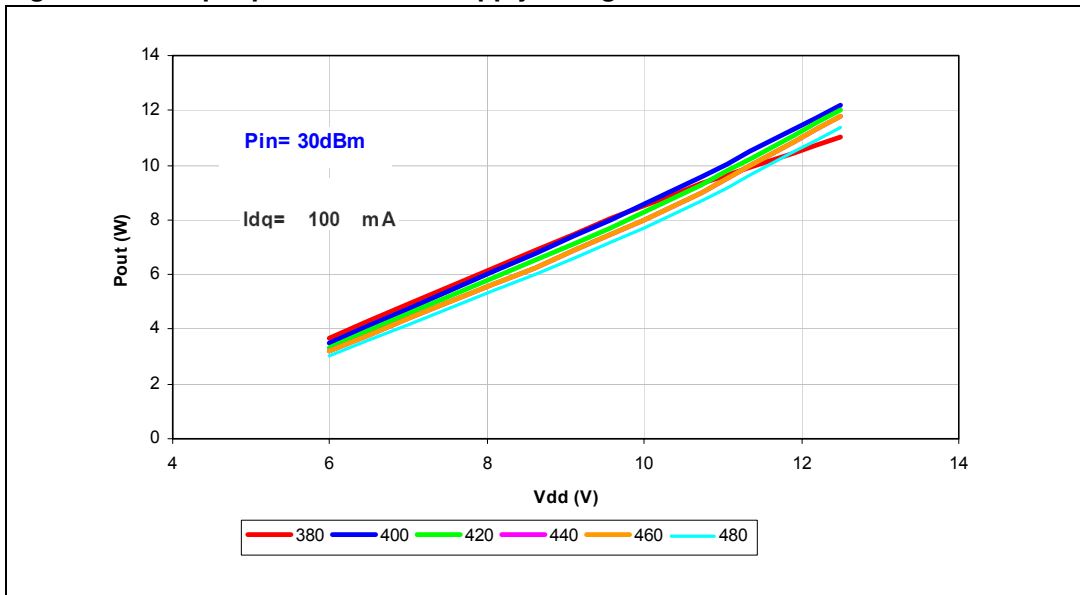


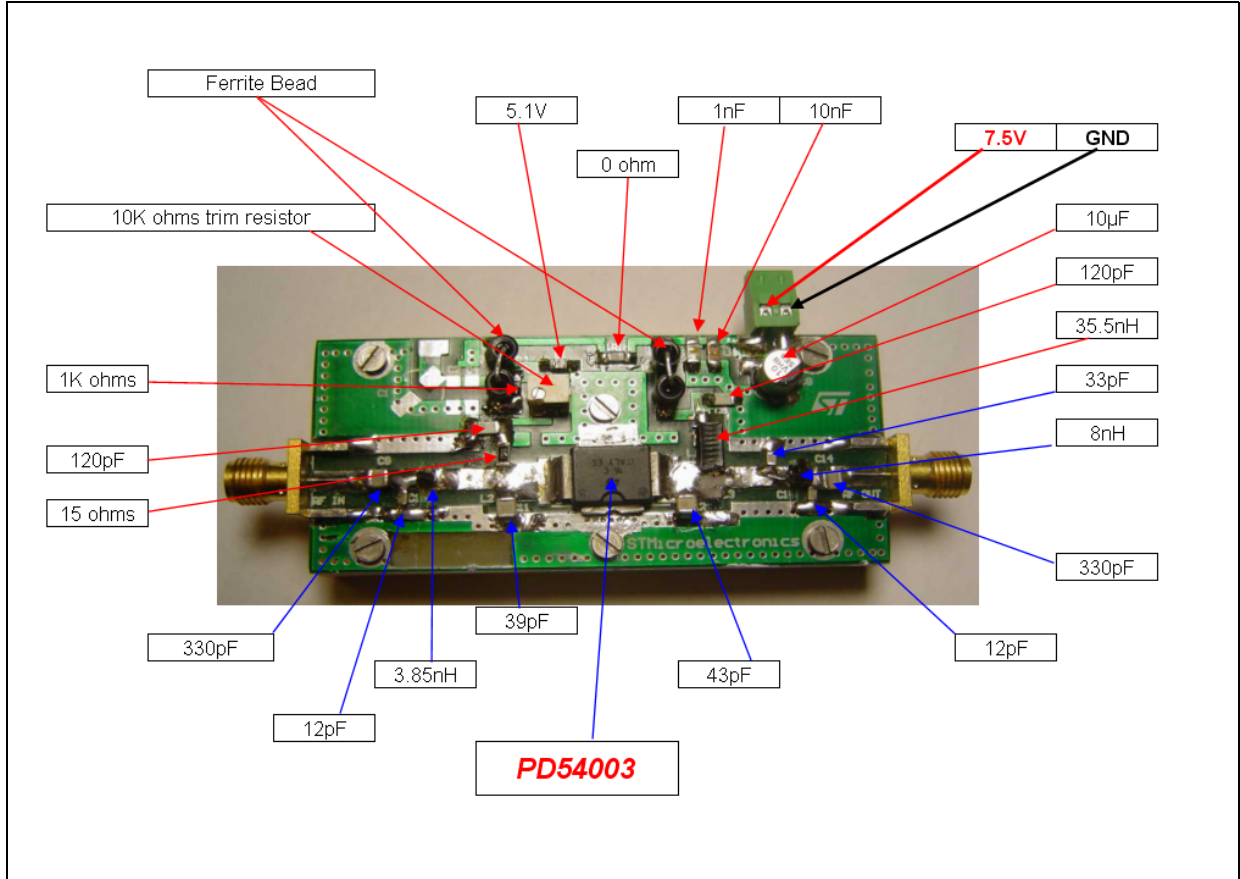
Figure 8. Output power vs drain supply voltage



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4 Test circuit

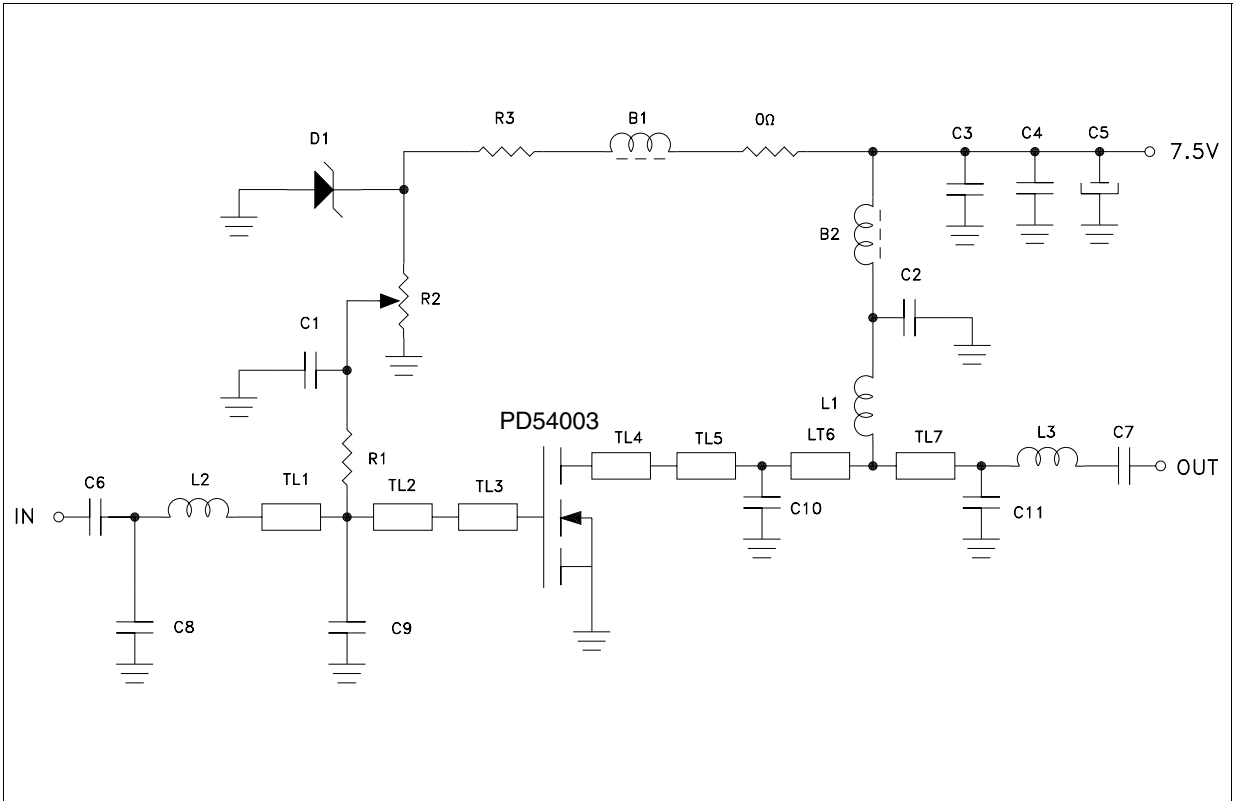
Figure 9. Test circuit schematic



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5 Circuit layout

Figure 10. Circuit layout



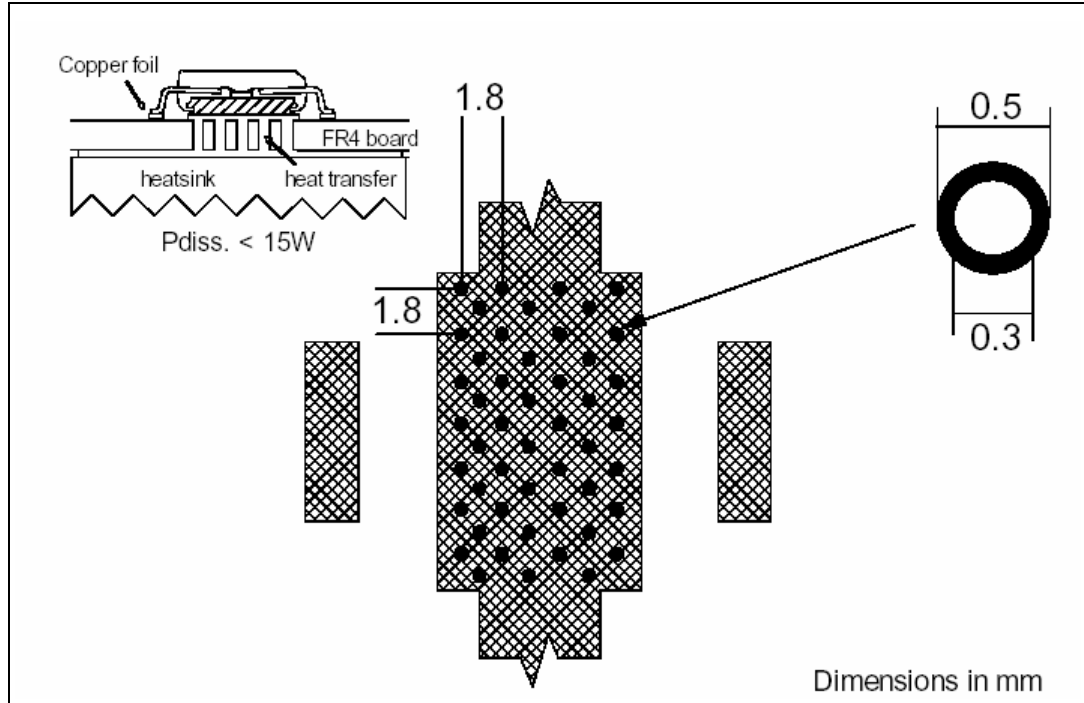
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Table 3. Components part list for DB-54003-470

Part Type	Component ID	Description	Value	Case size	Manufacturer	Part Code
CAP	C1	Capacitor	120 pF	1206	Murata	GRM42-6C0G121J50
CAP	C2	Capacitor	120 pF	1206	Murata	GRM42-6C0G121J50
CAP	C3	Capacitor	1 nF	1206	Murata	GRM42-6C0G102J50
CAP	C4	Capacitor	10 nF	1206	Murata	GRM42-6X7R104K50
Electrolytic CAP	C5	Capacitor	10 uF	SMT	Panasonic	EEVHB1V100P
CAP	C6	Capacitor	330 pF	100B	ATC	331
CAP	C7	Capacitor	330pF	100B	ATC	331
CAP	C8	Capacitor	12 pF	100B	ATC	120
CAP	C9	Capacitor	39 pF	100B	ATC	390
CAP	C10	Capacitor	43 pF	100B	ATC	430
CAP	C11	Capacitor	12 pF	100B	ATC	120
TL	TL1, TL7	Transmission Line	W = 2.87 mm L = 7 mm			
TL	TL2	Transmission Line	W = 4.9 mm L = 5 mm			
TL	TL3, TL4	Transmission Line	W = 6 mm L = 3 mm			
TL	TL5	Transmission Line	W = 4.9 mm L = 2.5 mm			
TL	TL6	Transmission Line	W = 4.9 mm L = 2.5 mm			
Ferrite Bead	B1	Ferrite Bead			PANASONIC	EXCELDRC35C
Ferrite Bead	B2	Ferrite Bead			PANASONIC	EXCELDRC35C
INDUCTOR	L1	Inductor	35.5nH		Coilcraft Mini Spring	B09TJ
INDUCTOR	L2	Inductor	3.85 nH		Coilcraft Micro Spring	0906-4J
INDUCTOR	L3	Inductor	8 nH		Coilcraft Mini Spring	A03TJ
TRANSISTOR	PD54003	LDMOS			STMicroelectronics	PD54003
Resistor	R1	Resistor	15 ohms	1206	TYCO ELECTRONICS	01623440-1
POT	R2	Potentiometer	10 K		BOURNS ELECTRONICS	3214W-1-103E
Resistor	R3	Resistor	1K	1206	TYCO ELECTRONICS	01623440-1
SMA-CONN	RF in	SMA-CONN			Johnson	142-0701-801
SMA-CONN	RF out	SMA-CONN			Johnson	142-0701-801
ZENER	D1	Zener Diode	5.1 V	SOD110	PHILIPS	BZX284C5V1
BOARD	FR-4 THk=0.060" 2OZ Cu Both Sides					

6 Mounting indications

Figure 11. Standard SMD mounting



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Figure 12 shows the recommended solder for devices that have Pb-free terminal plating and where a Pb-free solder is used.

Figure 12. Recommended solder profile

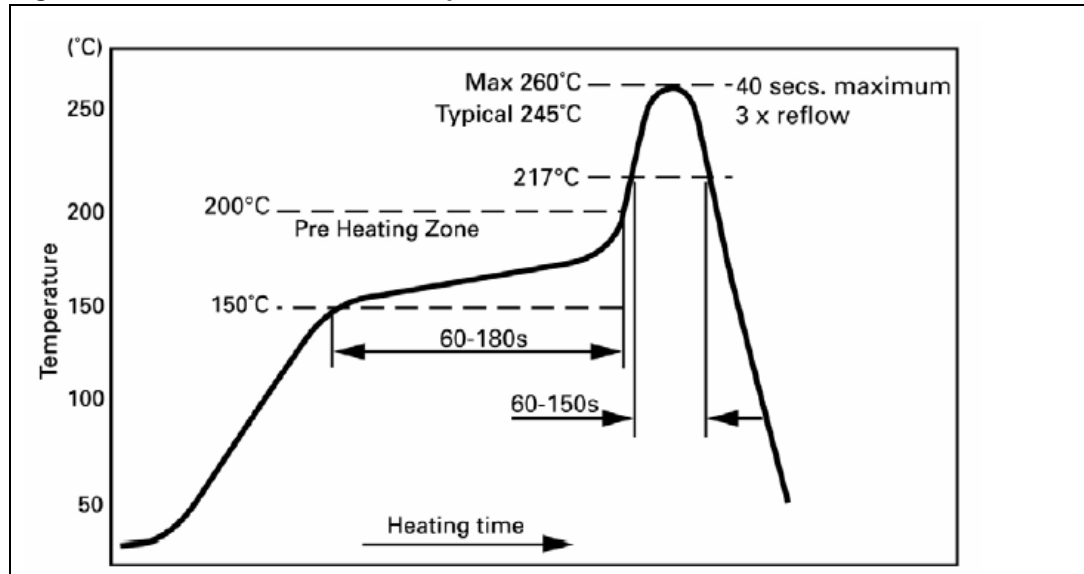


Figure 13 shows the recommended solder for devices with Pb-free terminal plating used with leaded solder, or for devices with leaded terminal plating used with a leaded solder.

Figure 13. Recommended solder profile for leaded devices

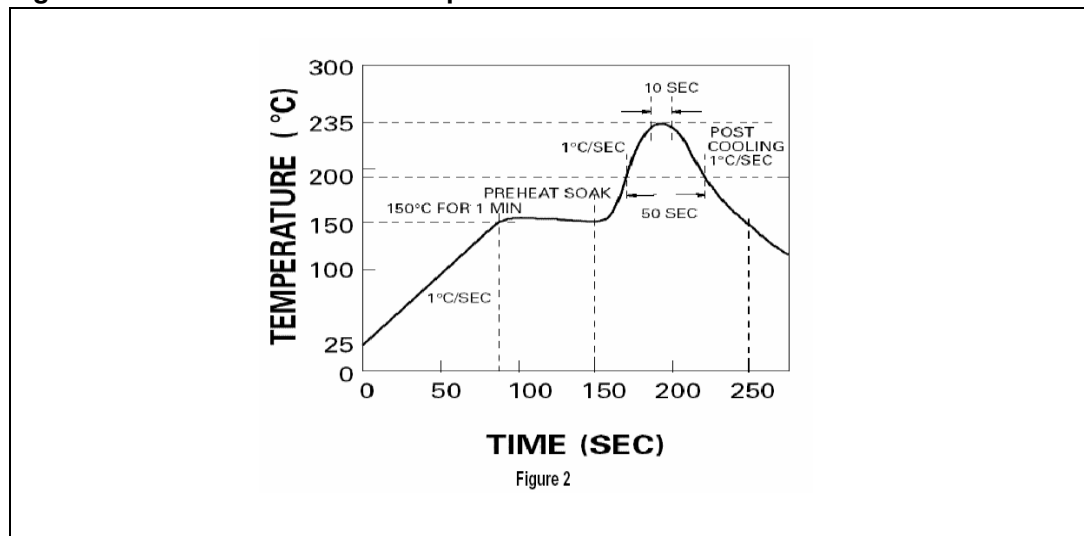


Figure 2

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

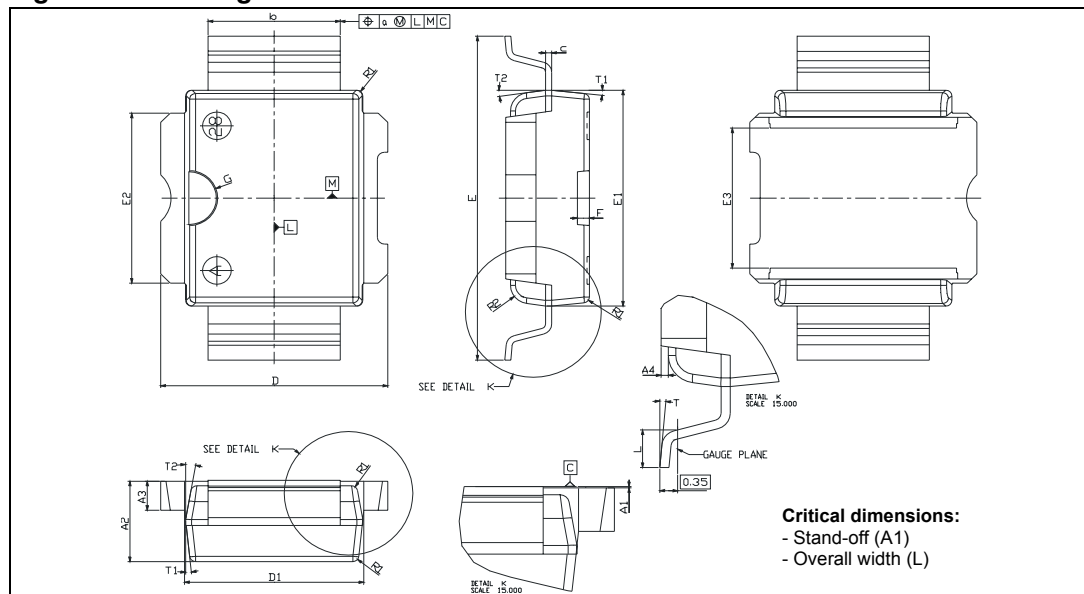
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Table 4. PowerSO-10RF Formed lead (Gull Wing) mechanical data

Dim	mm.			Inch		
	Min	Typ	Max	Min	Typ	Max
A1	0	0.05	0.1	0.	0.0019	0.0038
A2	3.4	3.5	3.6	0.134	0.137	0.142
A3	1.2	1.3	1.4	0.046	0.05	0.054
A4	0.15	0.2	0.25	0.005	0.007	0.009
a		0.2			0.007	
b	5.4	5.53	5.65	0.212	0.217	0.221
c	0.23	0.27	0.32	0.008	0.01	0.012
D	9.4	9.5	9.6	0.370	0.374	0.377
D1	7.4	7.5	7.6	0.290	0.295	0.298
E	13.85	14.1	14.35	0.544	0.555	0.565
E1	9.3	9.4	9.5	0.365	0.37	0.375
E2	7.3	7.4	7.5	0.286	0.292	0.294
E3	5.9	6.1	6.3	0.231	0.24	0.247
F		0.5			0.019	
G		1.2			0.047	
L	0.8	1	1.1	0.030	0.039	0.042
R1			0.25			0.01
R2		0.8			0.031	
T	2 deg	5 deg	8 deg	2 deg	5 deg	8 deg
T1		6 deg			6 deg	
T2		10 deg			10 deg	

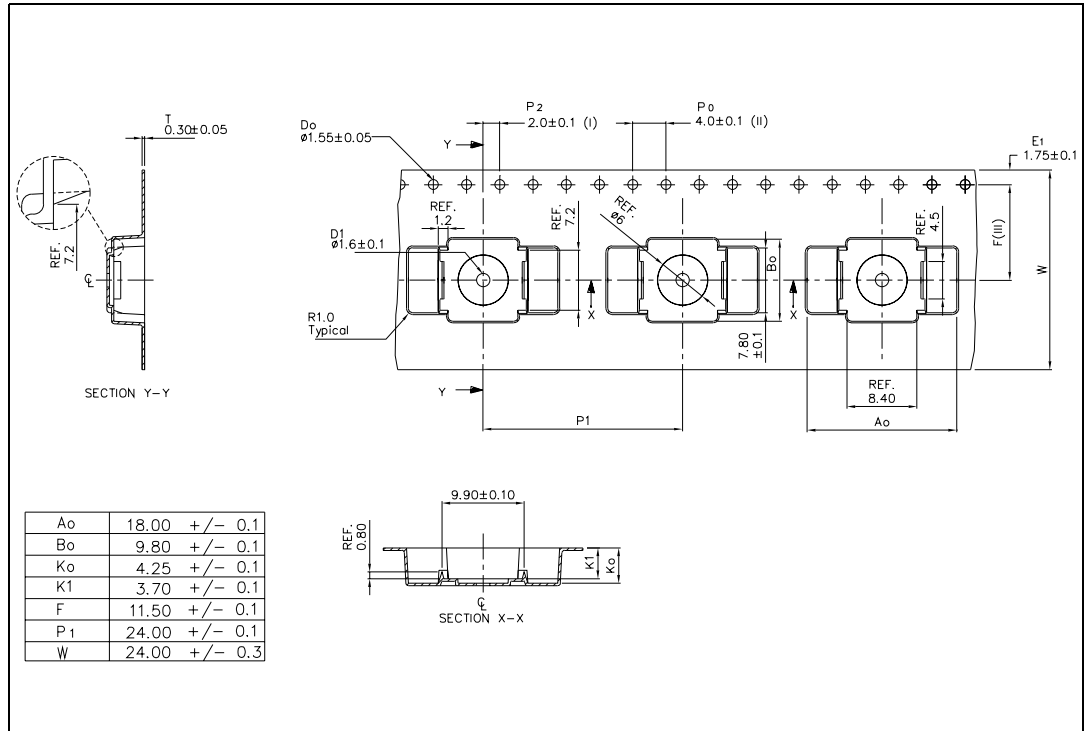
Note: Resin protrusions not included (max value: 0.15 mm per side)

Figure 14. Package dimensions



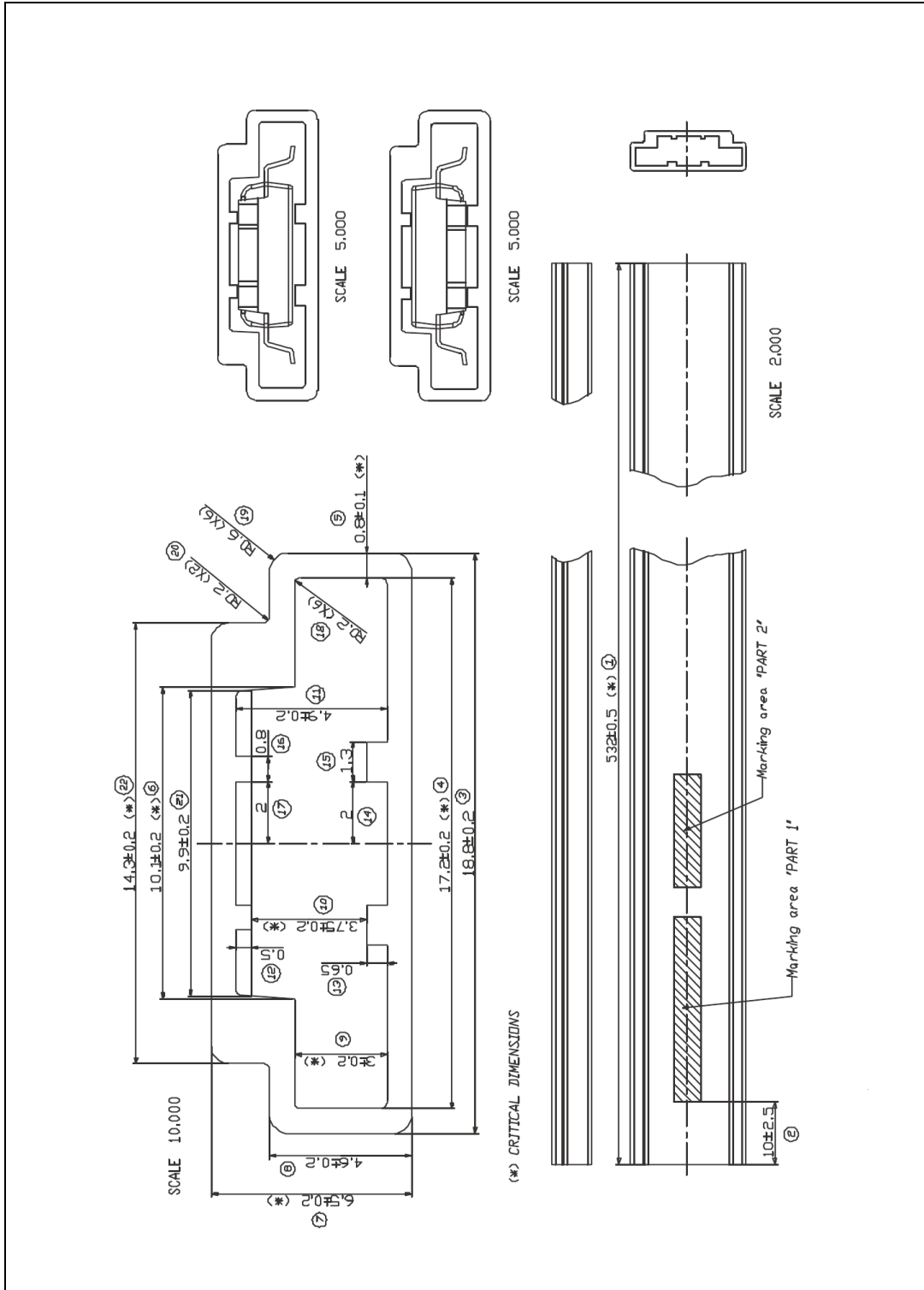
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Figure 15. PowerSO-10RF Tape & reel



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Figure 16. Tube information



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8 Revision history

Table 5. Revision history

Date	Revision	Changes
13-Jun-2006	1	Initial release

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